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ORIGINAL ARTICLES.

TRICHINOSIS.

A CLINICAL STUDY OF FIFTY-TWO SPORADIC CASES.[1]

By W. Gilman Thompson, M.D.,

PROFESSOR OF MEDICINE IN THE CORNELL UNIVERSITY MEDICAL COLLEGE, NEW YORK.

Since the accidental discovery by Frederick Albert Zenker, in 1860, of *Trichina spiralis* as the cause of serious endemics of disease, such endemics and sporadic cases have from time to time been reported in the United States, but trichinosis is usually referred to in the literature as a rarity, and the reports of cases are often so superficial as to argue lack of familiarity with the disease. The fact that I have been able to obtain records of fifty-two sporadic cases occurring during the past six years (observed in my personal practice and in the service of colleagues and myself in the Presbyterian and Bellevue Hospitals) proves that trichinosis is much more common as a sporadic disease than is usually supposed—at least in the vicinity of New York, where there are so many immigrants whose dietetic habits render them liable to infection.

In New York City the Meat Inspectors of the Department of Health direct their examinations mainly to the detection of tuberculous meat, and no systematic microscopic examination is made of the various products of swine flesh.

Owing, moreover, to the frequency with which I have found demonstrable trichinosis unsuspected or wrongly diagnosed, it is

[1] Read at a meeting of the Association of American Physicians, Washington, D.C., May 4, 1910.

my belief that sporadic examples of the disease are much more prevalent than is generally supposed. The following analysis of the fifty-two cases may serve to emphasize the importance of this subject:

In trichinosis the onset of symptoms is acute, either in the form of sudden chills or muscular pains, with vomiting, severe frontal headache, prostration and fever. In a majority of the cases in which the date of infection could be fixed definitely, the onset took place after two weeks' incubation, the extremes being nine days and three weeks. In some cases after an acute onset the patient was better, perhaps able to return to work, when, in a few days, prostration again overtook him.

The vomiting, which is an early symptom in the more severe cases, may be accompanied by intense abdominal cramps and contractures of the leg muscles. Diarrhœa is by no means a constant symptom. I have remarked it as an immediate symptom in several patients who had eaten tainted swine flesh, when it appeared due rather to ptomaine poisoning (botulismus) than irritation by the trichinæ. As a later symptom it characterized about one-fifth of the cases. Others exhibited constipation throughout, or constipation alternating with occasional diarrhœa. Tympanites was often present, and in one case there was hemorrhage from the bowel. Repeated search for trichinæ was made in the stools and blood of the patients, but they were never discovered.

Distinct chills or indefinite rigors were present in about one-fourth of the cases, usually occurring within the first few days of the disease. The chills were followed not infrequently by sweating, and profuse sweats were common throughout the grave cases.

Erythema was often manifest in the face and neck, sometimes also over the body. I have not noticed the general pruritus referred to by one or two writers, but have once or twice observed herpes labialis, urticaria, and a macular eruption on the abdomen, not unlike the roseola of typhoid fever. In one of my cases serious epistaxis occurred.

In all the more severe cases there was early complaint of great muscular weakness and prostration, while, sometimes, but by no means uniformly, there was loss of weight. One patient of the series lost fifteen pounds. As a point of distinction from typhoid fever, the loss of weight is not usually commensurate with the extent or duration of the temperature in trichinosis. The muscle pains and tenderness are usually very general and severe, but in many cases the pains were most intense in special groups of muscles, especially in the arms, calves of the legs, and thighs. Tenderness over the diaphragm was common. In exceptional cases the muscular pains and tenderness were so slight as to be very little complained of, at least at the time when the patient came under observation. In such cases the trichinæ are probably already firmly encysted.

The eye symptoms were interesting. Severe pain and burning sensations in the eyes were usually complained of. and were distinctly localized, independent of the headache. I have seen three cases in which there was circumscribed corneal hemorrhage, bilateral and close to the iris, which probably was due to local irritation by the trichinæ. In one additional case only was vision affected temporarily. There was an optic neuritis with œdema of the retina near the optic nerve, and small hemorrhages in the macular region of the left eye, while the fundus resembled that of acute nephritis. From time to time small fresh hemorrhages appeared in both eyes, but the process entirely cleared up.

F. J. Parker[2] reported several cases from the Presbyterian Hospital dispensary, among which were four with tenderness of the eye globes on pressure, diplopia, and pain on rotation. In four cases there was conjunctivitis, and in one neuroretinitis with œdema and hemorrhage of the retina. In two there were subconjunctival ecchymoses.

C. Stauble[3] reports a case with subcorneal ecchymosis and Kratz observed this symptom in eight patients in an epidemic of 264 cases in Hedersleben. Dilatation of the pupils has also been recorded.

Œdema of the eyelids was present in one-fourth of the cases of my series, at some time during their course. It may be so slight as to escape the patient's notice, or severe and accompanied by swelling of the cheeks and forehead, so as to make the face resemble the appearance in acute nephritis.

Œdema of the ankles was common, and sometimes there was swelling about such major joints as the knees and elbows, an appearance which often has led to a mistaken diagnosis of rheumatism. The œdema occurs irrespective of the localization of pain.

Cough was present in a number of cases, with slight bronchitis, probably due to irritation of the bronchi by the parasites, but the latter were not found in any of the sputum examined.

Dyspnœa was a very common symptom, but it was usually objective rather than subjective, and unaccompanied by pulmonary signs or cyanosis. It often appeared to be due to invasion of the diaphragm muscle by the trichinæ, for in such cases the abdomen was markedly sore and the type of breathing thoracic. The maximum rate of breathing observed in any case was 60, and in a number of cases it reached 36.

The urine, as a rule, presented few abnormalities, but in some cases scattered red blood corpuscles and a trace of albumin were observed. In one patient a subacute nephritis developed, and in a case seen in consultation there was an acute hemorrhagic nephritis with excessive hemoglobinuria. In this case, however, the urine

[2] Medical Record, August 3, 1907, p. 179.
[3] "Trichinosis," Weisbaden, 1909, p. 59.

was also "smoky," as in carbolic acid poisoning, and the patient had been drugged with an excess of potassium iodide and salicylates, in the mistaken belief that he was suffering from obstinate rheumatism. Micturition sometimes is painful. A positive diazo reaction frequently was obtained.

The leukocytosis, as a rule, was not excessive, and apparently never as high as it may be in many purulent infections, pneumonia, gas poisoning, etc. In one-third of the cases it was not above 15,000, and in only three cases was it above 32,000, the maximum being 40,200. Polynucleosis varied from 28 to 87.5 per cent. The lymphocytes varied from 4 to 20 per cent.

Attention was first called to the high percentage of eosinophiles in the blood of patients having trichinosis by the researches of W. S. Thayer and Thomas R. Brown,[4] and it has proved of great diagnostic importance. This percentage was above 20 in thirty-one cases, or considerably more than half the series; it was above 40 in almost one-fourth of the cases, and the highest records were two cases giving 60 per cent., one 52, one 74, and two 81 per cent. In one of the latter the full blood picture was as follows:

Polynuclear cells	14
Large lymphocytes	1
Small lymphocytes	3
Large mononuclear	1
Eosinophiles	81
	100

In another case, with phenomenally high eosinophilia the blood picture showed:

Polynuclear cells	28.6
Transitional cells	0.0
Large mononuclear cells	0.0
Lymphocytes	11.4
Basophiles	0.0
Eosinophiles	60.0
	100.0

In another case there were 28,750 leukocytes, with the following differential count:

Polynuclear cells	16.5
Lymphocytes	5.5
Transitional	4.0
Eosinophiles	74.0
	100.0

In repeated examinations in this case the eosinophiles rose in number as the leukocytosis declined. C. Stauble noticed this rela-

[4] Lancet, 1897, and Jour. Exper. Med., 1898, No. 3,

tionship in experimental trichinosis in animals. In an experimental research in guinea-pigs, this author[5] produced eosinophilia of 52 per cent. with artificially induced trichinosis, and Kerr[6] reported a case in a man with 86 per cent. of eosinophiles. T. H. Dexter[7] reported cases with eosinophilia up to 68 per cent. H. Albert and H. W. Norris[8] reported a case of trichinosis with an eosinophilia of 72 per cent. J. L. Hirsch[9] reported a house endemic of five cases of trichinosis in one family from eating raw ham. In one of these cases there was 45 per cent. of eosinophilies, and in none was the eosinophilia definitely related to the severity of the symptoms. In one of the five cases of trichinosis reported by Thomas R. Brown[10] the eosinophilia reached 50 per cent., and in another, 49 per cent. The eosinophilia sometimes presented considerable fluctuation during the progress of the disease. Thus, in one case of my series the count fell from 33 per cent. to 7.5 and rose again to 12 per cent. The eosinophilia affords no accurate index of the severity of the symptoms, either as to fever, muscle pains, or otherwise. For example, in one case the eosinophilia was 74 per cent., while the temperature was only 102° F.

One of the most protracted and serious of my cases gave the following blood count (made by Thomas W. Hastings): Leukocytes, total, 10,000; polynuclear cells, 70 per cent.; lymphocytes, 20 per cent.; eosinophiles, 12 per cent. At this time the patient's temperature was 105° F. While he was convalescing, with normal temperature, and no pain or tenderness, the eosinophilia rose to 62 per cent. In another case the eosinophiles numbered only 28 per cent., while the temperature was 105° F. In one case the eosinophiles numbered only 3 per cent. at the time when trichinæ were obtained from the gastrocnemius, although they had previously numbered 10 per cent. at the onset and 24 per cent. subsequently.

In another case the eosinophilia, which was 30 per cent., while the temperature was 104° F., rose to 52 per cent. after the temperature had been normal for ten days. As the eosinophiles accumulate around the encysted trichinæ their percentage may vary with the site from which blood is obtained for examination. For example, in one case blood from the infected muscle area gave 59 per cent., but that from the ear lobe (which was not tender) yielded only 33 per cent. I have been unable to obtain data as to the duration of the eosinophilia after recovery, for the patients usually being well, pass from observation, but one man went home in good health still showing 62 per cent. of eosinophiles, and K. Schleip reported 45.2 per cent. in a convalescent.

[5] "Trichinosis," Weisbaden, 1909.
[6] Phila. Med. Jour., August 25, 1900.
[7] New York State Jour. Med., March, 1910, vol. x, No. 3.
[8] Jour. Amer. Med. Assoc., November 21, 1908.
[9] Ibid., January 15, 1910.
[10] Med. News, January 7, 1899.

Various theories have been advanced regarding the function of eosinophilia. Bazzicalupo[11] discusses the connection between eosinophiles and antibodies in the serum, with the conclusion that they bear a direct relation to the presence of toxins in the blood, being in inverse relationship to the production of antibodies. There are, however, so few diseases of pronounced toxemia in which eosinophiles are notably increased, that their role cannot be very important. They have been found increased under the following conditions (1 to 4 per cent. being normal in adults):

1. In pneumonia, just before the crisis, exceptionally, 5 or 6 per cent.

2. In a few skin diseases of wide distribution, such as dermatitis exfoliativa, pemphigus, psoriasis, prurigo, general eczema, such bulbous eruptions as dermatitis herpetiformis, and in leprosy, in all of which they rarely reach 10 or 12 per cent., and do not long remain at that ratio. James C. Johnston and Hans J. Schwarz report from the Cornell University Medical College Clinic[12] a case of dermatitis herpetiformis with eosinophilia of 9.6 per cent., and one of prurigo of Hebra, with 21 per cent., subsequently falling to 2.6 per cent. No mention is made, however, of the exclusion of possible intestinal parasites as a complication, and in another of their cases of prurigo, the eosinophilia was only 3 per cent. In trichinosis, however, the eosinophilia is not only *invariably* present, but usually in high degree, and remains long. Thomas R. Brown found 24 per cent. of eosinophiles in a case of chronic eczema, and John W. Coe[13] found 51.8 per cent. in a case of pemphigus, 21 per cent. in one of psoriasis, 20 per cent. in one of dermatitis herpetiformis, and 18 per cent. in one of psoriasis. In all such exceptional cases, however, the diagnosis is, of course, obvious from the presence of the cutaneous lesion, but care should be exercised to exclude the possible coexistence of intestinal parasites of some kind. Moreover, in cutaneous cases of equal severity, eosinophilia is by no means constant. For example, in a second case of pemphigus studied by Coe, it was absent.

3. With intestinal parasites (other than trichina spiralis). The eosinophilia accompanying uncinariasis, round worms, tapeworms of various species, and other intestinal parasites, is rarely very high, and never so high as in most cases of trichinosis. I have seen it 2.3 per cent. with tenia saginata, and only 1.5 per cent. with ascaris.

4. In bronchial asthma. In an obstinate case of bronchial asthma which I have lately observed in a girl, aged twenty years, the eosinophilia during a paroxysm reached 12 per cent. Repeated examination of the stools failed to reveal evidence of any form of intestinal parasite, and trichinosis was positively excluded. Thomas R. Brown cites a case of bronchial asthma with an eosinophilia of 22.4 per cent.

[11] Gaz. degli Ospedale, Milan, xxix, No. 35.
[12] New York Med. Jour., March, 1909.
[13] Presbyterian Hospital Reports, New York, 1904.

Ira S. Wile,[14] in a general study of eosinophilia, says that a moderate increase in eosinophiles may be produced exceptionally by such drugs as camphor, potassium iodide, and sodium salicylate, but I have never observed it even when large doses of these drugs were being administered. He also claims that improvement in tuberculosis is accompanied by eosinophilic increase.

Microscopic examination of sections of muscle were made in various cases from such muscles as the deltoid, biceps, and gastrocnemius.

In twenty-nine cases trichinæ were found, and in five more an acute myositis was present. In the remaining eighteen cases either no examination was made, or no trichinæ were found in the specimen isolated, but in all these cases the other symptoms, such as a high degree of eosinophilia, puffiness of the eyes, dyspnœa, fever and generalized muscular pains and soreness justified the diagnosis, especially as such cases frequently occurred in connection with one or two others, in which the trichinæ were found—that is, among patients simultaneously exposed to infection.

In one case the fragment of biceps muscle examined by Dr. Meakins, of the Pathological Department of the Presbyterian Hospital, showed the encapsulated spirillæ lying between the muscle fibers, each surrounded by a zone of eosinophiles. In two cases small round-cell infiltration of the muscle was recorded, and in another there was infiltration with round and polygonal cells together with eosinophiles. Another case presented between the muscle fibers minute cysts with dense granular contents.

The temperature rise is one of the most interesting symptoms. It is fairly acute and varies from a few days to several weeks in duration—in the longest case of the series ten weeks, in the shortest, three days. In the ordinarily severe cases it remains at a maximum of 104° F. to 104.5° F. for four to five days, when it declines gradually, with daily fluctuations of about three degrees F.

The subsidence is always by lysis. In average cases the temperature consumes from ten to sixteen days in falling from 104° F. to normal, but not infrequently, after falling to 100° F. or 101° F., it remains constant at that low level for many weeks. In one case a temperature between 100° F. and 105° F. lasted ten weeks. In another case the temperature ranged between 101° F. and 100° F. for forty days, and a large number exhibited more or less fever for six weeks. In twenty cases of the series the temperature passed the 104° F. record, in three it was 105° F., and in two, 105.5° F. In more than half of all the cases it rose considerably above 102° F. Despite the high and often protracted fever, the patients usually appear much less ill than with similar grades of fever due to other causes, and are rarely delirious. One of my patients presented a tempera-

[14] Med. Record, January 29, 1910.

ture of 105.5° F., an eosinophilia of 62 per cent., and trichinæ in the muscle fragments removed, yet the man had comparatively little muscle soreness throughout, and felt so well at the height of the fever that it was with difficulty he was persuaded to remain in bed.

In a few cases—four or five—after an interval of three or four weeks of apparent recovery, there was a return of symptoms, and in several there was a decided exacerbation of temperature and other symptoms after their partial decline. As a rule, however, improvement once begun, progresses uninterruptedly, although very slowly.

The nationality of the patients included a wide range. The majority naturally, from their dietetic habits, were foreigners, such especially as natives of Hungary, Poland, Norway, Bohemia, Germany, Austria, and Italy, but not a few were Americans. Six of the private patients whom I have seen were Americans in good social position, victims of infected sausage and potted ham. The previous diet of those patients who could give an intelligent account of it after the long intervening latent period had elapsed, included such foods as raw pork, raw ham, potted ham, imperfectly smoked ham, head cheese, and a variety of sausages.

Albert and Norris, in the article above cited, report an endemic of fourteen cases of trichinosis occurring in 1908 in Grinnell, Iowa, from eating imperfectly boiled ham.

The disease, as met with in this country, is rarely fatal, although the patients may become very seriously ill. There were only two deaths among the entire series of cases presented. One of these occurred in a Pole in my service, who had only 5 per cent. of eosinophiles, while trichinæ were discovered in the deltoid. He acquired erysipelas and pneumonia, which, rather than the trichinosis, were the cause of death. The other patient, the only one in whom the disease may rightly be said to have been the cause of death, died in delirium with respirations of 60, a pulse of 132, dry tongue, and high fever. In this case the maximum eosinophilia was 14.5 per cent.

That the eosinophilia of trichinosis, which is unique in its excess is due to some specific toxin generated through the agency of the parasite, might be argued from the fact that in acute or subacute polymyositis, unattended by trichinosis, it is absent; hence it is not the polymyositis alone which causes it. In one case of this type which I recently observed, and in which trichinosis was definitely excluded, there was no eosinophilia, and in three cases reported by Benjamin T. Burley[15] he had the same experience. On the other hand, if the hypothesis be correct that a specific toxin caused by the agency of the parasite is responsible for the aggregation of eosinophiles, which occurs around the organisms in between the muscle fibers, one would naturally expect the eosinophilia of the blood to be at its maximum before the parasites became encysted and quies-

[15] Jour. Amer. Med. Assoc., January 18, 1908; see also Amer. Jour. Med. Sci., this issue, p. 167.

cent; yet in many of the cases herein recorded, such was not the fact, notably in that of the patient whose maximum eosinophilia of 62 per cent. was not reached until more than six weeks after his first symptoms appeared, when he was practically well. It is difficult to understand how in such a case the eosinophilic response can be in any sense protective. Moreover, the eosinophilia is entirely independent of definite relationship to either the general leukocytosis or the course of the fever. The question is obscure and experimental evidence is much needed to elucidate it. Some of the tapeworms, notably Dibothriocephalus latus are known to generate specific toxins causing anemia, yet their eosinophilic response is much less than that of trichinosis. In a case of this sort which I have elsewhere reported,[16] the eosinophilia never exceeded 9 per cent., although a condition of pernicious anemia was produced, of extraordinary degree.

Von Leube[17] states that it is impossible to distinguish polymyositis from trichinosis in many cases without examination of excised muscle, and Hepp,[18] in an early account of polymyositis, referred to it as "Pseudo-trichinose," but in the light of recent study the diagnosis ought not to be so difficult even without excision of muscle, for in polymyositis eosinophilia is lacking, as well as the eye pains, marked headache, puffiness of the eyelids, vomiting and peculiar dyspnœa, which characterize all the more severe cases of trichinosis. Apart from polymyositis, those diseases for which trichinosis is most often mistaken are typhoid fever, paratyphoid fever, septicemia, acute rheumatic fever, estivo-autumnal fever, multiple neuritis, and acute poliomyelitis.

The temperature charts of cases of trichinosis very often closely resemble typical charts of typhoid fever in the third and fourth week, and the headache and occasional epistaxis may be confusing, but in trichinosis the patient is usually proportionately less ill and lacks the nervous phenomena of typhoid fever. Moreover, the onset of trichinosis is more acute, with vomiting and muscular pains and cramps. The two diseases may, however, co-exist, as they did in the original case of Zenker, which led him to discover the trichinæ in a routine examination for degenerated muscle fibers in a patient who had died from typhoid fever. Fischer[19] and MacCrae[20] have each reported a case of combined trichinosis and typhoid infection.

Exceptionally, the trichinosis charts may resemble the markedly remittent temperature curve of septicemia or of a estivo-autumnal fever with chills and sweats, but a thorough examination of the blood in all such cases ought to resolve all doubt.

Occasionally, in trichinosis there is swelling about such major joints as the knees and ankles, and this, with the pain caused by

[16] Med. News, April 8, 1905.
[17] Medical Diagnosis.
[18] Berl. kin. Woch., 1887, xxiv, 297–322.
[19] Deut. med. Woch., 1898, xxiv, 821.
[20] Amer. Jour. Med. Sci., 1902, cxxiv, 56.

voluntary movement and sweating, may give rise to an erroneous diagnosis of rheumatism. I have lately seen a case which had been mistaken for rheumatism for a week, owing to such symptoms, and the fact that the patient a year before had had a typical acute articular rheumatism. The hemorrhages into the cornea led me to suspect the presence of trichinosis, and the latter diagnosis was confirmed by finding eosinophilia and the presence of trichinæ in an excised fragment of the gastrocnemius.

I saw another interesting case in a lad, aged eighteen years, in which a diagnosis of rheumatism similary had first been made, for which that of acute poliomyelitis had later been substituted by the physicians in attendance. The latter diagnosis was held because of a recent epidemic of poliomyelitis occurring in the same locality, and the patient suffered such excruciating pains in the extremities that lack of motion was mistaken for paralysis. Having demonstrated that paralysis did not exist, I suspected trichinosis from the slight puffiness of the eyelids and a diaphragmatic type of dyspnœa I obtained a blood examination as follows:

Hemoglobin	85 per cent.	
Erythrocytes	5,032,000	
Leukocytes	24,300	
Polynuclear cells		76.5
Transitional		0.9
Lymphocytes		7.4
Eosinophiles		15.2
		100.0

I found that the patient had eaten poorly cooked "Bolognas" two weeks prior to his illness, and a similar milder case was found in the cook who had partaken of the same food.

To recapitulate: There should be no difficulty in determining promptly a correct diagnosis of trichinosis based upon the observation of the following symptoms:

1. Acute onset usually with vomiting and abdominal cramps.
2. A high grade of eosinophilia, invariably present; usually above 30 per cent., and frequently much higher—even above 80 per cent.
3. A high grade of temperature, often reaching 104° or more, and lasting, in lessening degree, for two to six weeks.
4. Puffiness of the eyelids and face, with pains in the eyes occurring in one-fourth of the cases.
5. Dyspnœa and diaphragmatic breathing occurring without cyanosis in about one-fourth of the cases.
6. The generalized muscle pains, cramps, soreness, and prostration, causing sometimes deceptive apparent immobility.
7. The sudden occurrence of symmetrical circumscribed corneal hemorrhages in a patient whose bloodvessels are not degenerated, should give rise to a suspicion of trichinosis.

AN EPIDEMIC (FOURTEEN CASES) OF TRICHINOSIS, DUE TO EATING BOILED HAM, WITH SPECIAL REFERENCE TO THE OCCURRENCE OF EOSINOPHILIA.

By Henry Albert, M.D.,
PROFESSOR OF PATHOLOGY AND BACTERIOLOGY IN THE STATE UNIVERSITY OF IOWA, IOWA CITY.

History of the Epidemic. During the month of October, 1907, an outbreak of trichinosis affecting fourteen persons occurred at Grinnell, Iowa. Thirteen of these were students at Iowa College, located in that city. The infection occurred from eating boiled ham in one of the clubs and at one of the restaurants. The ham in all cases was obtained from the same packing house, and represented meat which had been inspected. Ten of the cases occurred among the students at one boarding club, three were young women students who, in company with three others, partook of ham sandwiches at a local restaurant, and one was a young man (not a student) who obtained ham at the same place. Most of the cases were diagnosed as trichinosis very soon after the beginning of the symptoms. The occurrence of so many cases among the members of the boarding house, the eating of boiled ham, the finding of trichinæ in the ham, together with the rather characteristic symptoms, made the diagnosis comparatively easy. Some of the cases were considered as typhoid fever, one as rheumatism, and one as a disease of the eyes, until the diagnosis became very evident, as determined by an examination of the blood. In no case was a positive Widal reaction obtained. The accompanying tabulation presents the important data of most of the cases.

A study of the epidemic reveals two features of special significance —the thermal death point of trichinæ and the value of eosinophilia in the diagnosis of trichinosis.

The Thermal Death Point of Trichina. The epidemic of trichinosis in question resulted from the eating of boiled ham. It is well known that the majority of cases result from the eating of uncooked seasoned or smoked pork or sausage, and we have been unable to find in the literature any instances of cases of trichinosis being traced to the eating of our popular boiled ham.

On making inquiry of several of our largest packing houses in regard to the length of time that their ham was boiled, we received from one the following answer: "When cooking boiled hams, we keep the temperature of the water about 190° to 200° F. for an hour; then permit the temperature to run down gradually to about 155° to 160° F. when the cooking is finished. Our rule is to cook the hams thirty-eight minutes per pound of weight—that is, a ten-pound ham would be cooked about six and one-half hours." Another wrote as follows: "We believe that the temperature of 170° F.

Tabulation of the Grinnell Epidemic of Trichinosis.

Case.	Age.	Sex.	Source.	Date of infection.	Date of beginning of illness.	Time between infection and first symptoms.	Symptoms (general).	Ultimate recovery (slow or rapid).	Duration of severe part of illness.	Symptoms Nov. 25, 1907.	Clinical diagnosis.	Blood examinations.						
												Date.	Number of leukocytes.	Per cent. eosinophiles.	Per cent. polymorphonuclear neutrophiles.	Lymphocytes.	Basophiles.	Widal reaction for typhoid.
1. H. L. B.	20	M	Boiled ham at club	Oct. 6, 1907	Oct. 18, 1907	12 days	Sore and stiff on rising in morning as with a cold. Muscles of neck, arm, shoulder, calf of leg sore, lame. Terrible aching in small of back. Much constipated.	Rapid	10 days	None.	Trichinosis.	Oct. 28, 1907 Nov. 21, 1907 Dec. 18, 1907 Jan. 22, 1908	9,000 8,200 7,300 8,000	72 24 16 6	16 42 62 72	12 32 22 22	 2 	 —
2. O. C.	21	M	Boiled ham at club	Oct. 6, 1907	Oct. 10, 1907	4 days	Diarrhœa, followed a week later with calves sore and lameness. No lasting effects.											
3. H.	21	M	Boiled ham at club	Oct. 6, 1907	Oct. 15, 1907	9 days	Symptoms suggestive of typhoid fever.	Rapid	10 days	Rather weak.	Typhoid, later trichinosis.	Nov. 9, 1907	8,000	24	59	16	1	—
4. J. L.	23	M	Ham sandwich at restaurant	About Oct. 5, 1907	Oct. 20, 1907	15 days	Sick at stomach; constipated; muscles weak.	Slow	....	"Feel bum."	Trichinosis.	Nov. 5, 1907 Nov. 21, 1907	14,000	4	76	20	..	—
5. Ma.	20	M	Boiled ham at club	Oct. 6, 1907	Oct. 15, 1907	9 days	Swelling of eyes, sore diaphragm. Treated for eye trouble.	Rapid	....	About well.	Eye troubles (one physician); trichinosis (another physician).	Nov. 1, 1907	5,400	22	51	27	..	—
6. R. M.	23	M	Boiled ham at club	Oct. 6, 1907	Oct. 13, 1907	7 days	Diagnosed as typhoid; fever ran up to 103°, lasted 10 days. Treated first for eyes, which were swollen. Constipated. Aching in muscles, especially in thighs. Four weeks after first had apparently a second attack.	Slow	10 days	Weak, muscular work makes muscles sore. Dropped out of college.	Typhoid (one physician); trichinosis (another physician).	Nov. 5, 1907 Nov. 11, 1907 Nov. 29, 1907	12,000 6,000 6,000	55 40 18	24 36 60	21 24 22	 ..	 —
7. Mur.	20	M	Boiled ham at club	Oct. 6, 1907	Oct. 16, 1907	10 days	Soreness in muscles and diaphragm. Constipated.	Rapid	3 to 4 days	.....	Trichinosis.	Nov. 27, 1907	6,900	24	50	24	2	—
8. R.	20	M	Boiled ham at club	Oct. 6, 1907	Oct. 15, 1907	9 days	Swelling of eyes; soreness in back, neck and side. Constipated. In bed with fever 11 days. Temperature, 100.5° to 102°.	Rapid	14 days	Almost none.	Trichinosis.	Nov. 7, 1907 Nov. 26, 1907	9,600 12,000	10 16	70 60	20 24	..	—
9 S.	21	M	Boiled ham at cl	Oct. 6, 1907	Oct. 15, 1907	9 days	Eyes swollen shut. Muscles of calves and shoulders sore and aching, could hardly walk. Constipated.	Slow	14 days	"Rheumatic"	Trichinosis.	Nov. 27, 1907	9,200	12	52	32	4	—
10. T.	20	M	Boiled ham at club	Oct. 6, 1907	Oct. 15, 1907	9 days	Soreness and aching of mucles, especially back of neck; eyes swollen. Much constipated. Fever 102°.	Rapid	14 days	Soreness of muscles until Nov. 20.	Trichinosis.	Nov. 27, 1907	8,600	12	58	30	..	—
11. M.	20	F	Ham sandwich at restaurant	Oct. 4, 1907	Oct. 15, 1907	11 days	"Terrible aching."	Slow	5 to 6 days	Run down—dropped work.	Trichinosis.	Oct. 29, 1907 Nov. 5, 1907 Dec. 18, 1907 Jan. 22, 1908	11,000 9,000 8,800 7,400	18 12 6 4	56 64 66 60	26 24 28 32	 4	 —

destroys the effectiveness of any trichinosis germs. We always see to it that this temperature and higher is reached in our ham boiling vats. It is to the short sighted financial interest of one who is boiling hams for the market to cook to the minimum amount, in order to avoid shrinkage in weight." From a third we learned the following: "Our hams are boiled at various temperatures, according to size, and the demand of the trade in different territories. I should say that the average temperature is between 200° and 212° F."

Just what temperature was used for boiling the ham which was the cause of the outbreak that I report it has been impossible to learn, the firm from whom it was obtained stating that their hams are boiled at various temperatures, according to the size of the piece and the demand of the trade. They state, however, that the average temperature is between 200° and 212° F.

"On page 211 of Ainsworth Mitchell's book on *Flesh Food*, the statement is made that trichinæ perish above a temperature of 69° C., or 140° F." On the other hand, the statement is made by Beecher[1] that a temperature of 180° F. will not always kill trichinæ. It is very improbable that boiled ham is at all a common source of trichinæ infection. If it were, cases would be far more frequent than they are. That it may occur, however, is evident from the history of our epidemic. It is probable also that many of the isolated cases of trichinosis, especially of the milder types, go unrecognized as such. It appears evident that we are not yet absolutely certain as to just what temperature, maintained for what length of time, and varying to what degree with the size of the piece, should be attained in order to be absolutely certain that all trichinæ have been killed. There is little doubt but that it will depend somewhat upon the degree of encapsulation of the embryonic forms and the nature of the capsule, whether it is simply a fibrous one or whether it has become calcareous. This is a subject which would be well worth investigation, inasmuch as it has been estimated that about 2 per cent. of hogs are infected with trichinæ, and inasmuch as our Government no longer inspects meat for home consumption for the presence of these parasites. Cooking seems to be the only effective prophylactic measure against trichinæ infection. Thorough salting and hot smoking also generally kill the parasites. They have been found alive in pickled meat for fifteen months, and have been known to resist freezing for two months.

THE VALUE OF EOSINOPHILIA IN THE DIAGNOSIS OF TRICHINOSIS. It is not the purpose of this article to refer in detail to the diagnosis and differential diagnosis of trichinæ infection. Suffice it to say, that many cases of trichinosis have gone unrecognized—some of the cases being diagnosed as typhoid fever, others as muscular rheu-

[1] Jour. Amer. Med. Assoc., 1906, xlvii, 1677.

matism, and still others as obscure conditions. H. U. Williams[2] found trichinæ in twenty-seven, or 5.3 per cent., of 505 unselected autopsies in which the death of the patient was due to some condition other than trichinosis. According to statistics collected by C. W. Stiles, there were reported in the United States, up to 1893, a total of 709 cases of trichinosis, of which 129 were reported from New York, 119 from Illinois, 115 from Massachusetts, 108 from Iowa, etc. Comparing these figures with the autopsy findings just mentioned, and a personal experience in connection with the investigation of thirty-two cases of trichinosis in Iowa during the past five years, makes it very evident that the figures are far from representing the actual number of cases that have occurred. Packard[3] reviewed the cases of trichinosis reported in the United States up to 1897.

During the acute attack the clinical symptoms are not always sufficiently distinct to enable a positive diagnosis to be made. The search for the parasite in the feces does not always give positive results. The examination of a piece of the affected muscle for the embryonic worms is often unsatisfactory—since, in the first place, the consent cannot always be secured for obtaining a piece of the muscle; and, in the second place, parasites are by no means always found, even in cases in which they exist. The occurrence of the eosinophilia, therefore, has become of more practical value in the diagnosis of this disease. The blood should be examined during the second and third week after infection, for it is then that the eosinophilia is usually at its highest. It is true that eosinophilia may occur in connection with other disease processes. It none, however, does it, as a rule, attain such heights as in trichinosis, nor does it occur in any conditions which are liable to be confused with infection with this parasite. The conditions in which it has been found especially are as follows:

1. Bronchial asthma in which the percentage of eosinophilia during and immediately following the paroxysms may be as high as 25 per cent.

2. In many infections of the skin, especially pemphigus, psoriasis, and other chronic conditions. In these an eosinophilia of 10 to 17 per cent. has been noticed.

3. Diseases of the bones are sometimes associated with a mild eosinophilia. Thus, the occurrence of an eosinophilia during the course of sarcoma suggests a secondary involvement of osseous tissue.

4. Intestinal parasites. Eosinophilia has been observed in connection with infection with uncinaria, oxyuris, ascaris, and the

[2] Trichinosis, Jour. Med. Res., July, 1901, Jour. Amer. Med. Assoc., September 28, 1901, p. 863

[3] On the Increase of the Eosinophilic Cells in the Circulating Blood in Trichinosis, Lancet, 1897, ii, 787.

teniæ. The eosinophilia in these conditions may vary from ten to twenty, or, in rare cases, even a higher percentage.

5. Trichina infection. It is in this condition that we find the most constant and altogether most marked eosinophilia. It begins as a rule, about the ninth to the twelfth day after infection, rising rapidly from the normal 2 to 4 per cent. to 35 to 50 per cent., and is at its height, as a rule, about three weeks after infection. The eosinophilia, therefore, is found to correspond to the time when the embryonic forms of the worm are migrating from the intestine and becoming localized in the muscle. The origin of the eosinophile cells and the cause of the eosinophilia has been a matter of some dispute and will be considered while reviewing the literature on the subject.

Thomas R. Brown,[4] was the first to call attention to the large percentage of eosinophiles found in the blood in trichinosis. His report appeared in April, 1897, Thayer[5] and Cabot[6] later, in 1897, also reported the finding of eosinophile cells in the circulating blood in trichinosis. In 1898 Brown again reported his finding of eosinophilia, describing two cases observed in the medical clinic of Johns Hopkins Hospital, at Baltimore. At the time of entrance the percentage of eosinophilia was 37. In one case the percentage reached 68.2. The three conditions to which Brown especially called attention are the marked eosinophilia, marked leukocytosis, and a reduction in the number of neutrophiles. Brown at first believed that in this disease the neutrophiles were transformed into eosinophiles in the muscle. He based this belief principally on the fact that when he first examined the muscle he found transition stages between neutrophiles and eosinophiles; whereas, when he examined it two weeks later, there was a marked increase of the eosinophile cells. His theory to explain the transition was that the local inflammation set up by the embryos entering the muscle cells caused a marked migration of the leukocytes to such areas. By virtue of their phagocytic activity they ingest bits of degenerated muscle tissue, which Brown believed changed the chemical composition of the cell and caused the transformation of the neutrophile into eosinophile granules. These cells then wandering back into the blood stream accounts for the marked eosinophilia. According to a more recent (1902) report by Brown, he leans favorably to the well-known theory

[4] Studies on Trichinosis, with Especial Reference to the Increase of the Eosinophilic Cells and Their Diagnostic Importance, Jour. Exper. Med., 1898, iii, 315–347; A Note on the Duration of Eosinophilia in Trichinosis, Boston Med. and Surg. Jour., 1898, cxxxix, 218; The Diagnosis of Trichinosis by Means of the Great Increase of the Eosinophiles in the Blood, Report of Fourth Case, Med. News, 1899, lxxiv, 12; The Origin of Eosinophile Cells and their Diagnostic and Prognostic Importance, Med. News, 1903, lxxxii, 1117; The Eosinophiles, Their Etiology, and Their Clinical Significance, Trans. Med. Soc. New York, Albany, 1903, 139,; Studies of Trichinosis, Johns Hopkins Hosp. Bull., 1897, viii, 79–81.

[5] A third Case of Trichinosis with Remarkable Increase in the Eosinophilic Cells, Phila. Med. Jour., 1898, i, 654; On the Increase of the Eosinophilic Cells in the Circulating Blood in Trichinosis, Lancet, 1897, ii, 787.

[6] Boston Med. and Surg. Jour., cxxxvii, 676.

of Ehrlich, according to which the eosinophile cells of the blood are derived from the eosinophile cells of the bone marrow, their appearance in the blood being due to some chemotactic influence. He still, however, holds to his original belief that some of the eosinophile cells are developed at the site of the lesion.

Atkinson[7] described a case in 1899 in which a diagnosis of trichinosis was based on the œdema, together with a marked leukocytosis and an eosinophilia of 50 per cent. In his case the eosinophilia gradually decreased as the symptoms subsided. The diagnosis was verified by the finding of a few non-encapsulated trichinæ in a section of a muscle.

In June, 1901, Da Costa[8] reported a case of a man who developed pain in the calf of the right leg. An operation was performed and a piece of the muscle removed. This, on examination, was found to contain a large number of trichinæ. A blood examination was then made; a leukocyte count of 17,600 was found, 3 per cent. of which were eosinophiles. The blood examination was made about a year after the pain, and it does not, therefore, indicate whether or not eosinophilia ever existed. The disease was limited to the part mentioned, and the diagnosis was not made until microscopic sections were examined.

Schleip[9] gives an interesting description of an epidemic of trichinosis which occurred in Homberg, in September, 1903. In all, 130 persons were affected. The diagnosis was made very soon after the appearance of the disease. He made a blood examination of some of his cases, all of which revealed an eosinophilia.

Early in 1904 Opie[10] performed experiments by feeding guinea-pigs with Trichinæ spiralis, and found a marked increase in the number of eosinophiles in the blood. He did not find any constant alteration in the number of cells until about the end of the second week after infection, when their relative and absolute number increased rapidly, reaching the maximum at the middle of the third week. This marked increase in the number of eosinophiles corresponds with the time when the embryonic trichinæ are being transmitted from the intestine to the muscles by way of the lymph and blood streams. He found an accumulation of eosinophiles in the mesenteric lymph glands. He also noticed characteristic changes in the bone marrow; the fat was gradually replaced with cellular elements and the number of eosinophiles was enormously increased, especially the eosinophilic myelocytes. Opie noticed that pork with 2000 to 3000 trichinæ failed to produce death of a

[7] Diagnosis of Trichinosis Made through Increase of Eosinophilic Cells in Blood. Phila. Med. Jour., June 3, 1899.

[8] Jour. Amer. Med. Assoc., 1901, xxvi, 1729.

[9] Die Homberer Trichinosis Epidemie und die für Trichinosis pathognominische Eosinophile, Deut. Arch. f. klin. Med., 1904, lxxx, 1.

[10] Experimental Study of the Relation of Cells with Eosinophile Granulation to Infection with an Animal Parasite (Trichina spiralis). Amer. Jour. Med. Sci., March, 1904.

guinea-pig, or did so only after several weeks. A larger dose is usually fatal in from one to two weeks. In all cases he noticed that there was a marked diminution in the number of eosinophiles some time before death, and that in severe infections no eosinophilia whatever appeared. In this connection it may be of interest to notice that Williams and Bentz did not find any noteworthy increase of eosinopbile cells in the blood of rats and cats artificially infected with trichinæ; on the other hand, Fox, working in the Histological Laboratory of the University of Iowa, noticed not only an eosinophilia of the blood, but also the characteristic change noted above, in the bone marrow in two cats which had been fed on the refuse of a slaughter house.

Straubli[11] reports seven cases, four of which terminated fatally. He notes that the eosinophiles begin to appear about nine days after the ingestion of the infected meat. In the cases which terminated fatally he found Kernig's sign present, and knee-jerks absent. In all of his cases the diazo reaction was pronounced—a point of special interest, because of the possibility of mistaking trichinosis for typhoid fever. He performed experiments on rabbits. In these he found a large number of the embryos in the heart's blood. His experiments confirmed his previous assumption, based on his clinical cases, that a rapid destruction of lymphocytes is a bad sign. He regards the eosinophilia as a reaction on the part of the organism to substances given off by the embryos or the degenerated muscle tissue. He found no local increase of eosinophiles in the muscles invaded by the parasites.

Conclusions. 1. Trichinosis is, no doubt, of far more frequent occurrence than is usually supposed. Many cases are no doubt diagnosed as cases of typhoid fever, rheumatism, ptomaine poisoning, cholera morbus, etc., or considered as obscure conditions.

2. Trichinosis usually results from the eating of uncooked seasoned or smoked pork or sausage, but may result from the eating of boiled ham which has not been exposed to a sufficient temperature for a sufficient length of time to kill all of the parasites.

3. A temperature of 170° to 200° F., maintained from one to six or more hours, depending upon the size of the ham, no doubt destroys the trichinæ in the vast majority of cases. Investigation made to determine exactly just what temperature maintained for what length of time is necessary to kill trichinæ should be made.

4. The severity of the case varies with the number and, no doubt, also the vitality of the parasites. In the outbreak which we reported, although the symptoms were in many cases quite severe, there were no deaths.

5. All pork consumed in any form other than boiled ham should have all parts raised to the boiling point.

[11] Klinische und experimentelle Untersuchungen über Trichinosis und über die Eosinophile im Allegemeinen, Deut. Arch. f. klin. Med., 1906. lxxxv.

6. The diagnosis of trichinosis occurring in isolated cases is frequently a matter of difficulty, and often can be greatly assisted by means of an examination of the blood.

7. So far as we know at the present time there is no condition in which the percentage of eosinophiles in the blood reaches such a high number so constantly as in trichinosis.

8. Eosinophilia occurs in practically every case of trichina infection. A few cases have been reported in which there was no eosinophilia (Da Costa, Howard, Rosenburger). Some of these were cases of severe infection, and in others an examination was made too long after the time of acute symptoms to be certain whether or not eosinophilia was or was not present at some time.

9. The eosinophilia of trichinosis varies, ordinarily, from 10 per cent. to 60 per cent. The highest percentage so far reported is 86 (Kerr).

10. Eosinophilia makes its appearance with the beginning of the acute muscular symptoms which represents about the seventh to twelfth day after infection. It is at its highest at the height of the acute muscular symptoms, which is, ordinarily, during the second or third week after infection. After this time it gradually disappears, so that at the end of the second or third month, there is usually no increase in the number of these cells.

11. The total leukocyte count is usually, but not invariably, increased in trichinæ infection. The number of neutrophiles is relatively, and sometimes absolutely, diminished during the period of eosinophilia.

In conclusion, I desire to express my thanks to Professor H. W. Norris, of Grinnell, for securing the clinical data and collecting specimens of blood; to the physicians of Grinnell, who furnished the clinical data, and to Dr. E. J. Ringena, of Deep River, who assisted in making the differential blood counts.

INTESTINAL DIVERTICULA.

A PATHOLOGICAL AND CLINICAL STUDY.

By John A. Hartwell, M.D.,

CLINICAL PROFESSOR OF SURGERY IN THE CORNELL UNIVERSITY MEDICAL COLLEGE; ATTENDING SURGEON TO THE BELLEVUE HOSPITAL; ASSISTANT SURGEON TO THE PRESBYTERIAN HOSPITAL, NEW YORK,

AND

Russell L. Cecil, M.D.,

INSTRUCTOR IN PATHOLOGY IN THE CORNELL UNIVERSITY MEDICAL COLLEGE; RESIDENT PATHOLOGIST, PRESBYTERIAN HOSPITAL, NEW YORK.

The condition known as diverticulum of the intestine has been recognized as a pathological entity for more than a hundred years, but knowledge of its relation to perforative peritonitis is of recent

date, and up to the present time few cases have been operated upon in which a pre-operative diagnosis was made. Cases, however, in which this condition proved to be the underlying cause of a peritoneal infection have multiplied of late, so that its complete analysis is a matter of interest, both to the scientific investigator and to the practical physician and surgeon.

The term diverticulum of the intestine may be applied to any outgrowth of the intestinal wall, not neoplastic in character, which has had at some time a lumen connecting it with the intestine, and whose walls are composed of structures similar to those found in the intestines. Under this definition, Meckel's diverticulum is included as a congenital anomaly, and the appendix vermiformis as a normal vestigial diverticulum. When the outgrowth is composed of all the structures which are found in the normal intestinal wall, it is called a true diverticulum. When some of these structures are absent, it is called a false diverticulum. That the former may become the latter, must be recognized.

The older classification into congenital and acquired diverticulum serves no useful purpose, and should be discarded, because with our present knowledge we can draw no distinguishing line between the two, except in the case of Meckel's diverticulum and the appendix; and we believe, as will develop later, that most, if not all, cases of diverticula have at least a congenital predispostion.

The structure of a diverticulum, when not inflamed, is very simple. If of the true variety, it is nothing other than the pouching out of the intestinal wall at some point. A section across the pouch shows the same coats arranged in the same way as in that part of the intestine of which it is an outgrowth. If of the false variety, the individual coats are more or less modified, and there is a practical absence of one or more of them, usually of the two muscular layers. In their early development, they are microscopical in size (Graser[1], Fischer[2]), and show at this time the characteristics of the true diverticulum. With their growth, however, the false characteristics come into evidence. If no inflammation supervenes, the structure remains unchanged during a considerable growth, so that the diverticula, varying in size from a buckshot to a hen's egg, may be seen presenting the simple structure above described. On the other hand, a varying amount of atrophy, particularly of the mucosa, may take place, and a hypertrophy of the submucosa and the subserosa. These changes are not, properly speaking, inflammatory, but are due to pressure. If no further alteration take place these diverticula do not give evidence of their presence by any clinical symptoms, in this respect resembling a Meckel's diverticulum and the appendix veriformis. If, on the

[1] Centralbl. f. Chir., 1898, xxv, Beil. 140; Verhandl. d. deutsch. Gesellsch. f. Chir., 1899, ii, 480; Verhandl. d. deutsch. path. Gesellsch., 1900, ii, 254; Münch. med. Woch., 1899, xlvi, 721; Langenbeck's Archiv, 1899, lix, 638.

[2] Jour. Exper. Med., 1900–01, v, 333.

other hand, inflammatory changes do take place, there are present exactly the same factors for producing mischief as exist in the appendix and Meckel's pouch.

Until recent years it was believed that these diverticula are rare. Now, however, they are known to be common, and with this knowledge has come the further knowledge that they are the seat of great potential danger to health and life. In making a systematic search, Graser found 10 cases in 28 autopsies; Sudsuki[3] found 15 in 40 autopsies; Stierlin (quoted by Verdenal[4]) found 10 in 38 autopsies. These were all in the lower colon or sigmoid. Baldwin[5] has found 14 diverticula of the duodenum in a systematic search of 104 cadavers in the anatomical room of the Cornell Medical School. In 81 autopsies done at the Presbyterian Hospital, in New York City, from June, 1909, to February, 1910, 5 cases of sigmoid- and colon-diverticula are recorded, all of a well marked size.

Intestinal diverticula have been found in every portion of the alimentary tract, from the pylorus to the anal ring. The duodenum has furnished a large number (Baldwin); the whole small intestine has shown them; the appendix vermiformis itself has not escaped (Fischer Mertens[6]), and they have been found in large numbers in the colon and the sigmoid. The infection producing ischio-rectal abscess may find its way from the bowel through a diverticulum (Chiari[7]), though the latter is rare in the lower rectum. Apparently the sigmoid is the favorite site for their development. This may be accounted for by the fact that the secondary causes in their production, as elaborated later, are more potent here than in other parts of the bowel.

Their comparative absence in the rectum proper is interesting and is ascribed by Schreiber[8] to the better musculature in this part. The total number found in one person may run high up in the hundreds. Structurally, they are the same no matter in what portion of the canal they are found, and there is no evidence that the etiological factors differ. In looking for their cause, therefore, we must accept only such conditions as are present along the whole intestinal tract, and such factors as do not conform to this condition must be excluded as primary causes.

A very large proportion of the diverticula of the small intestine occur either between the mesenteric leaves or close to them, (Fig. 1), and this fact led to the belief that there existed an inherent weakness here which was responsible for the hernial protrusion. The colon, however, often shows them placed laterally (Fig. 2). Herczel[9] and Good[10] showed that bulging of the intestinal wall first took place at the mesenteric border when the dead intestine was subjected to increased

[3] Langenbeck's Archiv, 1900, lxi, 708.
[4] Diss., Lyon, 1907.
[5] Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1902, ix, 743.
[6] Deutsch. Arch. f. klin. Med., 1902, lxxiv, 122.
[7] Inaug. Diss., Zurich, 1894.
[8] Personal communication.
[9] Med. Jahrbücher, 1878, 419.
[10] Beitr. z. klin. Chir., 1889, v, 690.

pressure within its lumen by distention with water. Hansemann[11] succeeded in producing actual diverticula. It was noted, however

FIG. 1.—Diverticula of the small intestine. The diverticula all occur along the mesenteric attachment. (Case XVIII.)

FIG. 2.—Diverticula of the colon. The diverticula lie between the lateral taniæ and the mesenteric attachment. (Case XVII.)

that the weakness was present only in old persons, and not in children. Klebs, quoted by Beer in a study of diverticula, first noted

[11] Virchow's Archiv f. path. Anat., 1896 cxliv, 400.

that the protrusion bore a close relation to the bloodvessels entering and leaving the gut along the mesenteric attachment. This fact has been corroborated by every subsequent observer, and it was noted that the same relation held in the artificially produced bulgings.

These pathological and experimental findings were made the basis of a full explanation of the etiology of diverticula, as follows: The mesenteric border is weak; it is weakest at the point of entrance and exit of the vessels, particularly the latter; this weakness naturally increases with age; a comparatively moderate increase in internal pressure determines the giving away of the wall at one of these points, and the diverticulum is an accomplished fact. The constipation of the old was given as the cause of the increase in pressure. This explanation was complete for the condition as then understood. Further consideration, however, throws much doubt on it. Chlumsky[12] showed that no conclusions drawn from experiments on the dead gut were admissible as explaining facts existant in the living gut. He experimented with the normal intestine in the living dog, and with the intestine ten hours after death. In the former the rupture took place invariably opposite the mesentery, while in the latter, along the mesenteric border. Moreover, Philipowitz[13] demonstrated that the dead intestine ruptured long before it had been distended to anything like the extent seen in the living subject in volvulus and other forms of obstruction. Beer[14] quotes these findings and uses them as arguments against the supposed inherent weakness along the mesentery. He further calls attention to the fact that clinically, rupture of the intestine, from whatever cause, almost invariably occurs opposite the mesentery. He explains the difference in the results in the living and in the dead intestine as due in the first instance to the pressure of the blood stream filling the vessels and thus closing the spaces of entrance and exit, while in the latter, that is, the dead gut, the empty vessels leave a place of lessened resistance around them. He says: "The supposed weakness of the mesentery—in the living intestine—does not exist, and as it does not exist, it has nothing to do with the origin of acquired diverticula."

Graser investigated the subject most thoroughly as applied to diverticula occurring in the sigmoid. He found the same relation to the vessels as other observers; that is, the hernial protrusion follows the emerging vein and often takes a wandering course through the intestinal wall finally to reach the subserosa.

In this passage the circular muscular coat first gives way and the longitudinal follows later, or may only be thinned out. He then sought for the actual cause of the diverticulum and thought he found it in the presence of any obstructive lesion to the free return of blood through the inferior mesenteric vein, particularly where, as in

[12] Beiträge z. klin. Chir., 1899, xxv, 539.
[13] Langenbeck's Arch., 1903, lxx, 679.
[14] Amer. Jour. Med. Sci., 1904, cxxviii, 135.

valvular heart lesions, the interference might be remittent. Under these conditions when the obstruction is marked the spaces through which the veins pass are dilated and the connective tissue and muscular bundles weakened. With the comparative collapse of the veins, when a free circulation is reëstablished, the spaces present a point of lowered resistance, and a gas or liquid pressure from within starts the development of the diverticulum. By a careful study of twenty-eight cases, from which he made over a thousand sections, in series, he believed he fully established this relation. He, however, pointed out the fact that the circulatory disturbance was only a predisposing cause, and that diverticula were not necessarily present in every case having such a disturbance.

Graser's view was opposed at the time he presented it, by Hansemann and others, and a year later Sudsuki made a study to prove its error. He examined, postmortem, twenty-eight sigmoids taken from patients who in life had suffered from interference with the venous return in the region of the inferior mesenteric vein, and found diverticula present in six of them. On the other hand, in twelve cases in which no evidence of such an interference existed, he found diverticula present nine times. He further showed that the size of the vein sheaths was independent of any obstructive lesion during life, the space often being distinctly larger when no such obstruction existed than it was in those cases in which it did exist. He concludes that Graser's findings were purely accidental, and that no causative relation exists between a circulatory disturbance and a diverticulum. He believed that the venous sheaths may be a point of weakness because of the thinning out of the connective tissue support in the subserosa and submucosa. This weakened point then gives way under the pressure of gas and feces, and the diverticulum results. Probably in the beginning it is of the true variety, but later the muscular coats give way, and it becomes false in character.

This explanation of the etiology may be accepted, in part at least, for those diverticula which are found near the mesentery where the veins are emerging, but, as Beer points out, it does not hold for those which occur on the convex side of the bowel. He, therefore, only accepts the weakening of the wall due to the passage of vessels through it as of secondary importance in a causative way. He offers the following explanation of the cause of diverticula: "There must be some change in the resistant powers of the gut wall. The fact that diverticula occur in old people, in people whose intestines have been more or less worked out, as evidenced by constipation, points to a muscular deficiency, and in this muscular weakness, the cause of the formation of false diverticula must be sought." . . . "It is very probable that the original view of Klebs is, in part, correct, especially with reference to the production of the diverticula in the small intestine, and that traction on the gut by the mesentery

is a factor in the production of the necessary weakness at this point, where these diverticula so regularly occur in the small intestine. That this traction is a reality can be easily demonstrated by distending loops of intestine *in situ*, or by noting the enormous tension of the mesentery in ileus cases. Naturally, in those parts of the intestine where no mesentery exists, this cannot be a factor."

That Beer's view is correct, so far as the pathological changes which lead to the diverticulum are concerned, we are willing to accept; but that he is incorrect in the primary cause of this change, namely, weakened musculature, due to age, is manifest from the fact that diverticula are found in children and young adults.

Ashhurst[15] has reported a case in a boy of seven, and two of the cases reported in the present series occurred in children of seven and ten years, respectively (Figs. 3 and 4). A number were found in per-

FIG. 3.—Piece of colon obtained from a boy, aged six years. In one of the haustra, two diverticula can be seen, one on either side of the anterior tenia. (Case VII.)

sons under thirty. In none of these was there clinical evidence of deficient muscular activity of the intestine. The following observation, too, is of value in this connection. An examination of the colon from five infants who had died from various infantile diseases was made for the purpose of demonstrating the presence or absence of points of weakness in their walls. The colons were moderately hardened in formalin, and then filled with water just sufficient to render the walls taut, but not under enough pressure to stretch them. In three of the cases there was some evidence of a weakness at one or more points, while in two such evidence was absent. In

[15] Ann. of Surgery, 1908, xlvii, 300.

each of the positive cases there occurred a slight outpushing of the wall of the intestine, about 1 cm. in diameter, which had somewhat the macroscopic appearance of the small diverticula seen in adults. The wall over the fundus of the sac seemed to inspection and palpation distinctly thinner than in other parts of the gut. Microscopically, in sections taken transversely through the guts at the points described above, the muscularis appears definitely thinner than in the adjacent gut wall.

We, therefore, are driven to the conclusion that up to the present time no complete explanation of the primary cause of intestinal diverticula has been offered. The most that can be said is, that from some cause a weakness exists in the intestinal coats, and by reason of this weakness, a pouching of the coats takes place when any undue pressure arises. Conditions such as age, constipated

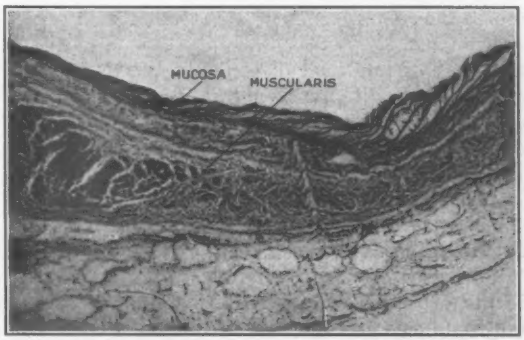

FIG. 4.—Microscopic section through a diverticulum in the sigmoid of a girl, aged ten years. The mucosa is flattened. The muscularis becomes thin and atrophic, almost disappearing over the fundus of the sac. (Case VIII.)

habit, excessive fat or emaciation, portal congestion, the anatomical weakness at the point of entrance or exit of vessels all play an undoubted role, but they are probably secondary to the inherent weakness above mentioned. Telling,[16] in a very able discussion of the condition, based on a study of 105 cases, leaves the question of etiology unsettled. In speaking of this, he asks: "Are they always acquired?" and says: "In answer to this question, it is significant that no case has been reported in a child (Hale White, Schreiber)—(this we now see is incorrect)—while the great majority are in the old, even aged, subjects. Moreover, the various points which have been successively established with regard to their etiology would seem to put the answers to this question beyond doubt, even though we admit that a congenital anatomical arrangement of

[16] Lancet, 1908, i, 843.

the muscle fibers, or of the connective tissue of the vessel spaces of the gut wall furnishes a special predisposition." "Whether this muscular weakness and thinning is a constant or frequent accompaniment, or whether it is a congenital or acquired condition, are points on which further research is needed."

It seems to us that great stress should be laid on the probability that a congenital defect in the musculature does exist, and that most diverticula occur because of this defect. Contrary to the expressed view, that young persons are not subject to them, as we have stated, there are many recorded cases in patients under thirty, and not a few in young children. Moreover, Edel,[17] Fischer, and others, as well as the specimens here presented, give strong evidence that in the first stage all diverticula are of the true type, and that only subsequent pressure destroys the muscular coats, showing that the muscular coats previously exhibited a weakened condition. The conditions found in the infant colons above referred to is very significant in this connection.

The pathology of intestinal diverticulum needs to be considered under two distinct conditions: its pathology when uncomplicated by secondary changes, and the pathology when such changes have intervened. A detailed study of this has been made by us on the material at our disposal, and is reported in full. Emphasis will be laid at this time only on those points which are of clinical significance.

It must be borne in mind that the diverticulum itself is absolutely a harmless condition as far as the health of the individual is concerned. Of the specimens reported in this paper, eighteen in number, four were the cause of symptoms during life. In each one of these the symptoms were due, not to the actual diverticulum, but to the secondary changes occurring from it. Telling names eleven possible conditions which may give rise to symptoms, and illustrates each one of them by one or more of the cases which he summarizes. Some of these are so nearly related, the one to the other, that they may be considered modifications of the same process, and their separation seems to confuse rather than to simplify. A practical working classification of the secondary changes which give rise to symptoms is one which is in every way comparable to those occurring in the case of the appendix.

1. There may arise an acute inflammation of the diverticulum without perforation, which results in a peritonitis or a cellulitis around it. Loomis[18] reports one case in which general peritonitis so resulted. The formation of adhesions to neighboring parts may cause an obstruction, more or less acute, either at the site of the diverticulum or in a loop of gut adjacent to it.

2. The inflammatory process may cause destruction of the coats of the diverticulum when a perforation results, leading either to a

[17] Virchow's Arch. f. path. Anat., 1894, cxxxviii, 347.
[18] New York Medical Record, 1870, iv, 497.

localized abscess, a general peritonitis, a general blood infection, or all three. The perforation may communicate with other hollow viscera, notably the bladder. Telling cites a case showing submucous perforations, so that fistulous tracts formed within the intestinal wall.

3. The diverticula may become the seat of a mild, subacute, or chronic inflammation, which does not produce marked changes. This condition is subject to temporary exacerbations and remissions. (Giffin,[19] Mayo.)

4. A chronic inflammation may occur in the diverticulum which leads to thickening of the walls of the diverticulum itself, and from the irritating effect of the toxins in the lymphatics and venules, the process spreads to the surrounding tissues, resulting in thickening of the whole intestinal wall and of its mesentery. When multiple diverticula are present, a long piece of the gut may be involved. Here, again, adhesions may lead to intestinal obstruction, or this obstruction may result from narrowing of the lumen. Here, also, a chronic perforation may take place.

5. Carcinoma may develop on the diverticulum. (Hochenegg,[20] Wilson and Giffin.[21])

Comparing these changes with those of the diseased appendix, we find them exactly analogous: that is, acute inflammation without perforation; acute inflammation with perforation; subacute and chronic inflammation without marked thickening; chronic inflammation with marked thickening; and carcinomatous development. The question naturally arises as to what is the cause of these changes. In the majority of cases they are probably due to the irritation caused by the fecal concretions in the intestines. For this reason the secondary changes are almost invariably found in the large intestinal diverticulum, where the solid feces become impacted in its lumen.

Gordinier and Sampson[22] report one case of inflammatory changes in a mesenteric cyst of the small intestine, with the presence of many diverticula in the adjoining intestine. But they fail to give microscopic evidence that the cyst was actually developed from a diverticulum.

The analogy between the causative factor in diverticulitis and appendicitis is again close, namely, irritation from fecal concretion. On the other hand, owing to the motility of the appendix on its mesenteric axis, it is liable to serious damage from circulatory disturbance which is not present in the case of the diverticulum. Consequently, acute gangrenous appendicitis is common, but acute gangrene of a diverticulum as a whole probably never occurs. Another distinguishing difference is, that inflammatory changes in

[19] Amer. Jour. Med. Sci., 1909, cxxxviii, 661.
[20] Verhandl. d. deutsch. Gesellsch. f. Chir., 1902, 402.
[21] Trans. Amer. Surg. Assoc., 1907, xxv, 237.
[22] Jour. Amer. Med. Assoc., 1906, i, 1585.

the appendix usually involve the mucous membrane to a marked degree, while the mucous membrane lining the diverticulum often escapes until actual perforation is imminent. Wilson discusses this, and would restrict the term "diverticulitis" to those cases in which the mucosa is primarily involved, and use the term "peridiverticulitis" for those cases in which the outer coats of the bowel and surrounding structures are inflamed. The former causes no material reduction of the lumen of the bowel, but tends to perforation into the peritoneal cavity. The latter produces a marked narrowing of the lumen, but owing to the marked reparative process, does not so readily lead to perforation. This distinction of terms seems to us rather superfluous, because the subserosa is quite as much a part of the diverticulum as is the mucosa. Moreover, in many of the cases in which perforation has been reported clinically a condition of "peridiverticulitis" did exist. It is also important to note that the inflammatory changes in diverticula are most marked in the connective tissue coats of its wall, the submucosa and the subserosa.

For this reason it is probable that the acute perforations result in chronically inflamed diverticula, and that the acute inflammations themselves are usually superadded upon a chronic inflammation. The tendency of a perforation of the diverticulum to communicate with the bladder is worthy of emphasis. Formerly, these communications between the sigmoid and the bladder were attributed mostly to cancer, but Harrison Cripps[23] collected sixty-five cases of vesicocolic fistula, in forty-five of which an inflammatory process was shown to be the underlying cause, as against nine in which cancer was so related.

The clinical manifestations of these conditions are readily understood by a direct application of these pathological changes.

It must again be emphasized that the diverticulum itself, that is, a pouch of the intestinal wall, is not capable of giving symptoms. It is only when added to this, there exist some of the secondary changes above described that the symptoms arise. Autopsy records show the frequent presence of diverticula which, even when packed full of feces during life, have given no hint of their presence (Fig. 5). Moreover, a very considerable degree of inflammation in the diverticulum, and in the immediate vicinity, may be present without giving symptoms. This is well illustrated in one of the clinical cases in this series in which a chronic perforation took place with no accompanying signs until the moment of perforation.

On the other hand, there may be evidences of the secondary changes present during the chronic stage. These are: disturbance of the action of the bowels, usually constipation, and possibly a dull aching pain.

These cases may recover spontaneously, according to Mayo,[24] and

[23] Diaser., London, 1888.

[24] Surg. Gyn. Obstet., 1907, v, 8.

he reports a case in which recurrent symptoms had been present over a period of years. Here, again, we see an analogy to appendicitis.

There are no symptoms referable to the varying inflammatory conditions that are in any way pathognomonic. The same clinical picture is seen when similar pathological processes are present from other causes. For this reason, rarely, if ever, has a positive preoperative diagnosis been made, and an error is not infrequent, even on opening the abdomen. However, certain symptoms are significant, and with our increasing knowledge, errors both before and during operation will become more infrequent.

The predilection of the descending colon and sigmoid to be the seat of serious changes in diverticula, leads at once to a tentative diagnosis of this condition when evidence of acute or chronic inflammation exists in the left lower quadrant of the abdomen. (One

FIG. 5.—Diverticula of the colon. The diverticulum is stuffed with feces. (Case XI.)

of our clinical cases, however, was in the ascending colon.) This, occurring in persons in the middle decades of life, is sufficient to suggest a diverticulum as the starting point of the trouble, but it must be emphasized that an increasing number of cases showing inflammatory symptoms are being found in young persons. The symptoms may be those of a local abscess, a more or less general peritonitis, or a partial or complete intestinal obstruction. They may be acute, subacute, or chronic. Owing to the absence of ulcerative changes in the mucous membrane, diarrhœa and blood in the stools are the exception, though the latter existed in the case of Moschcovitz, the specimen from which is included in this series. The usual absence of these symptoms helps to differentiate the condition from tuberculous inflammations, and, to a certain extent, from syphilitic inflammation and carcinoma.

In those cases in which the inflammatory exudate is extensive,

leading, as it may, to a palpable tumor, there are no clinical manifestations which differ from a similar condition due to other causes. The absence of other evidence of tuberculosis or syphilis, and the absence of blood in the stools, all point to the presence of diverticular trouble, but a positive diagnosis cannot be made. The greatest difficulty exists under some circumstances in excluding carcinoma of the sigmoid. The resemblance to this neoplasm is so close that many surgeons have been in error after opening the abdomen, the thickened indurated section of the gut being in every way the same in both processes, and primary resection has been done because of the mistaken diagnosis. Telling, in his pathological classification, gives as one type those mimicking carcinoma, and adds that he believes that many an inflammatory lesion would be found to be present in jars on museum shelves labelled "carcinoma," if their contents were carefully examined.

Moynihan[25] reports five cases in which a resection was done in the erroneous belief that cancer was present. In two of these the lesion was positively demonstrated to be due to diverticular inflammation. In a sixth case the indurated colon and sigmoid were believed to be the result of cancer, and the case was considered inoperable. The subsequent recovery proved the error of this diagnosis, and the case probably should be included as diverticulum disease. An entero-vesical fistula, with gas or fecal matter passing out with the urine, points to a diverticulum rather than to cancer. Thus we see that, clinically, we recognize a classification which conforms in every particular with that adopted for the secondary pathological changes.

Beer, Telling, Eisendrath,[26] and others have formulated tables of such classification, which possess merit. However, an understanding of the possible anatomical lesions serves every purpose, and since all these lesions have now been reported clinically, a table of clinical possibilities is nothing more than a repetition.

The treatment for the secondary changes growing out of the presence of diverticula, except the milder grades of chronic inflammation, is purely operative. A laparotomy must be performed, and the actual condition met with must be treated on the general principles of intestinal surgery. In the case of a perforation, it may be dealt with by simple excision of the necrosed area, and suture, or a section of gut may be excised and an anastomosis done. The latter is only needed when the perforation is large, and the adjacent gut wall is so thickened that a proper closure cannot be effected.

A second indication for excision of the gut is the narrowing of the lumen by inflammatory thickening to a point which threatens its patency. But in this connection it must be remembered that much of the inflammatory exudate may be absorbed when the exciting cause, namely, the inflamed diverticulum itself, is removed. On

[25] Brit. Med. Jour., 1907, ii, 1381. [26] Arch. of Diag., 1909, ii, 368.

the other hand, we must bear in mind the possibility of more than one diverticulum being present, so that a proper attention to the perforation, or the most apparent pouch, may not remove the causes exciting inflammation. Again, the possibility of the development of cancer as a subsequent change must be given its full weight in deciding against intestinal resection.

The surgical management of the local abscess, the general peritonitis, the adhesive ileus, or the fistulous opening into the bladder is exactly similar to these conditions from other causes and needs no amplification here.

The following clinical cases and postmortem specimens illustrate many of the facts included in the foregoing *resume*. The clinical cases have all been presented before the New York Surgical Society during the session of 1909–1910. So far as we know, none of the other cases have been previously reported.

CASE I (Hartwell, Presbyterian Hospital).—O. G., male, aged forty-two years, mechanic; was admitted to the Presbyterian Hospital, in the service of Dr. Eliot, to whom I am indebted for the privilege of reporting the case, on April 21, 1909, suffering from an acute abdominal lesion. The family and past history were negative. Two days before admission he developed the typical symptoms of an acute intestinal obstruction, and these had increased continuously until admission. For three or four days prior to the acute symptoms he had noticed that his bowels were constipated—an entirely unusual thing.

Physical examination on admission showed the abdomen uniformly distended and tympanitic. About one inch inside the anterior spine of the ileum, and above it, was felt an elongated mass along the course of the sigmoid, the size of an apple. This mass was tender. Careful questioning failed to get any evidence that the patient had ever been conscious of any abdominal lesion prior to the onset of the acute symptoms. With these, however, the pain was most severe at first at the site of the tumor.

Under gas-and-ether anesthesia a laparotomy was immediately done, the peritoneum being opened over the mass. A walled-off abscess was found lying outside the sigmoid, just above the pelvic brim, which communicated with the lumen of the bowel through a gangrenous looking perforation. For a distance of about two inches the entire bowel wall was markedly thickened, as was the mesentery connected with it. There were two adhesion bands kinking and pressing on the gut in such a way as to cause the obstruction, but it was noted that the colon, as far as could be seen above this point, was not unduly distended. No diagnosis was made as to the pathology of the lesion. Cancer and tuberculosis were thought of as the most probable, though diverticulitis also was mentioned. A primary resection of the diseased portion was done, with an end-to-end suture anastomosis. The abdominal wound was sutured with drainage.

The post-operative course was unsatisfactory, and the symptoms of obstruction increased rather than lessened. After twenty-four hours, therefore, the wound was opened, and as the anastomosis did not look entirely satisfactory, though the lumen was patent, the stitches were removed and a Murphy button inserted. The patient recovered after a rather tedious convalescence, and has remained well up to present time.

The specimen removed consists of a piece of sigmoid 7 cm. long. (Fig. 6). The peritoneal fat and appendices epiploicæ are abundant. On the external aspect of the section is an indurated mass, irregularly

FIG. 6.—Part of the sigmoid. On the right is an indurated mass of inflammatory tissue, laid open along the tract of the perforating diverticulum. (Case I.)

globular, measuring 4 to 6 cm. in diameter. This mass lies within the gut wall and is covered externally with peritoneum and intestinal fat. Through this mass passes a perforation into the intestinal lumen, admitting a surgical probe. The surface of this sinus is ragged and ulcerated. The perforation passes through the posterior part of the mass, and a transverse section through the mass shows the mucous membrane pouching out along the line of the perforation, demonstrating the presence of a diverticulum at this point. There are four other diverticula present, having an average depth of ½ cm.; two of those lying adjacent to the one that has perforated

show a lesser amount of induration in their walls. Microscopically,[27] a section taken through the tract of the perforation shows extensive necrosis and acute inflammatory changes involving all the coats of the gut (Fig. 7). At one place the mucosa dips down as if to form a diverticulum, but becomes almost at once unrecognizable in a mass of necrotic tissue. This necrosis involves the muscularis, which is considerably thinned out at this point, as well as the subperitoneal fat tissue. The parts surrounding the necrosis are densely

FIG. 7.—Microscopic section through a perforating sinus. The section shows the mucosa abruptly terminating in a mass of necrotic tissue. The wall of the gut is thickened and infiltrated with leukocytes. (Case I.)

infiltrated with polymorphonuclear leukocytes and lymphoid cells. Sections through two of the adjacent diverticula shows both of them to be true diverticula, being surrounded by normal muscularis of the usual thickness. The subserosa contains many lymphoid cells, with a few polynuclear leukocytes. Both of these diverticula are more or less cylindrical in shape, maintaining about the same diameter throughout their entire length. The deeper one measures 1.2 cm. in length; the other, 0.7 cm.

[27] In the microscopic study of the diverticula, the following technique was used: The sections were cut either longitudinally—that is, parallel to the long axis of the intestine—or transverse to this axis, or both. All sections thus include normal intestine adjacent to the diverticulum and the structures occurring in the neck and fundus of the sac. The sections were stained with hematoxylin and eosin. In addition, duplicates of each section were stained by the Van Gieson method. In every instance, small diverticula, never over 1.5 cm. in diameter, have been used for the microscopical sections.

CASE II (Hartwell).—Male, aged twenty-three years. Admitted to the Presbyterian Hospital August 9, 1909, giving a complicated clinical picture, which is reported in full elsewhere.[28] He presented at operation the following condition: The abdomen contained a small amount of fluid, of characteristic serous exudate. The large intestine, from the splenic flexure to the rectum proper, was found to be the seat of a marked uniform thickening, involving its whole circumference. This wall was estimated to be about $\frac{3}{8}$ inch in thickness, so that the intestinal tube was rigid and hard, but its lumen was not appreciably narrowed. At the splenic flexure the lesion had, to a certain extent, kinked the bowel, causing a moderate degree of obstruction. The mesentery of the descending colon was thickened quite as much as the bowel itself. The spleen was soft and somewhat enlarged. No other lesions were found in the peritoneal cavity, a thorough examination being made to find tuberculosis, but without avail. The adhesions which were causing the obstruction were loosened, and the whole length of the descending colon was examined for the purpose of finding a perforation or any other cause for the condition at hand. The process gave all the appearances of a simple inflammatory thickening, involving the bowel and its mesentery. It was impossible to eradicate the disease, consequently the abdomen was closed with drainage. A pathological report on the peritoneal fluid showed it to be sterile.

A microscopical examination of a small piece of the tissue removed from the surface of the bowel showed it to be fat, infiltrated with small round cells, and extravasated blood. There was an increase of fibrous tissue and the walls of the bloodvessels were thickened, and the lumen contracted. There was no especial perivascular change, and no evidence of either syphilis or tuberculosis could be found. The diagnosis made by the pathologist was chronic fibrous peritonitis.

The postoperative history was uneventful. There was but little drainage from the wound, and it healed kindly. Since his discharge from the hospital, on September 10, the patient has been attending to his work, and is in very excellent general health. There is still present a mass in the left lower abdomen, which is not materially changed since the operation, but it gives rise to no symptoms whatever. All the evidence at our disposal points to the condition of the colon as being one of a simple inflammatory process involving the coats outside of the mucous membrane. Tuberculosis and syphilis both involve the mucous membrane, and give symptoms of this involvement. Cancer must be ruled out by the extent of the disease, and the subsequent good health of the patient. On the other hand, such inflammatory thickening arises from diverticulitis, as has been amply demonstrated, both by previous writers and by the specimens

[28] Proc. New York Surgical Society, Annals of Surgery, April, 1910.

here presented, and we therefore think that it is proper to include the case as one of probable multiple diverticulitis. In this connection Telling states that he has found the thickening to be more marked in those diverticula with small openings, and narrow channels. Such diverticula cannot be demonstrated from the external surface of the thickened bowel.

Case I showed the same condition in a local area, but here a perforation was also present. These are the cases that give the mimicry of cancer.

CASE III (Hartwell).—A. G., female, aged forty-three years. Admitted to the Presbyterian Hospital, August 30, 1909. For ten years she had suffered from recurring attacks of abdominal pain, coming on at night and being relieved by vomiting. The pain was general, but was most severe in the epigastrium. Two years prior to admission into the hospital the pain began to localize itself in the right lower quadrant of the abdomen. With the attacks there was fever. They recurred every three or four months, and lasted about one week. She habitually suffered from constipation. There was never any knowledge of blood in the stools. The physical examination showed no abnormalities except some evidence of a chronic pelvic peritonitis, and a mass in the right lower quadrant of the abdomen. This was about the size of a billiard ball, of stony hardness, and fairly smooth surface. It was tender to pressure. It occupied the middle outer part of the quadrant, and was firmly adherent to the posterior abdominal parieties.

Operation was performed on September 12. On opening the peritoneum the mass was found to lie just outside the cecum, and to consist of the appendix, the cecal wall, and adventitious tissue. The appendix was much thickened, but not acutely inflamed. It lay with the tip pointing upward, outside of the cecum, buried in hard tissue. On dissecting it free, the tip was found to be closely adherent to the colon, just anterior to the outer mesenteric leaf, where it closed a necrotic opening 0.5 cm. in diameter in the much thickened and hard wall of the colon. This opening admitted a probe into the lumen of the bowel. The appendix was removed. The tissue for some distance around the sinus was cut away in two pieces, and the opening thus made closed with three layers of sutures. The lumen of the colon and cecum contained old, partially digested blood clots, the origin of which could not be determined.

The post-operative course was uneventful, and the patient remains well at the present time.

The specimen consists of: (1) Two pieces of intestinal wall (cecum), both of which show considerable thickening. In one of the pieces there is a small saccule, 8 mm. in diameter and 9 mm. in depth, lined with mucous membrane, which appears to have pushed through the muscularis. (2) An appendix, 4 cm. in length; serosa of distal portion covered with fibrin; no perforation; mucosa smooth. Micro-

scopically: (1) Sections taken through the diverticulum show a small sac lined with intestinal mucosa, which is thrown up into small folds. At one point the mucosa is necrotic. The lumen of the sac contains pus. The wall of the sac is composed of fibrous tissue, apparently thickened serosa, infiltrated with polymorphonuclear leukocytes and lymphoid cells, but free from necrosis. No muscular tissue remains in the wall. Its blunt point of termination on either side of the sac is sharply defined (Fig. 8). The terminal muscle fibers show signs of atrophy and are being replaced by fibrous tissue. (2) Sections thorugh the cecum adjacent to the diverticulum show considerable thickening of the muscularis and serosa, and a universal infiltration by polymorphonuclear leukocytes, lymphoid and plasma cells in all the coats. There is a formation of fresh granulation

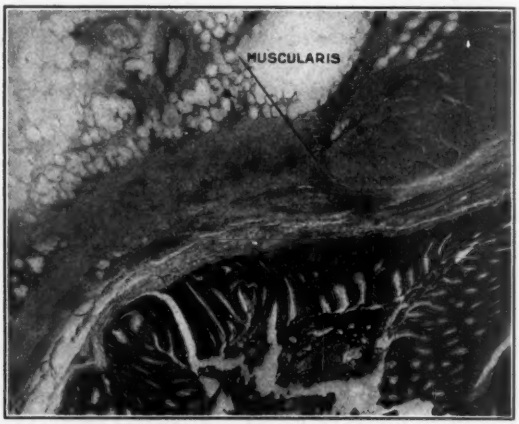

FIG. 8.—Microscopic section through a diverticulum. (Only half of the diverticulum is shown.) The muscularis ends abruptly at the neck of the sac. The wall of sac is composed of mucosa and serosa. The latter is infiltrated with leukocytes. (Case III.)

tissue on the serosa. (3) Appendix. The mucosa is intact. The muscularis and serosa contain a moderate number of lymphoid cells. The serosa is thickened. Our interpretation of this case is that the cecum contained a number of diverticula. One of these had perforated and sloughed away. A second one, acutely inflamed, is the one from which the above described section was taken.

CASE IV (Moschcowitz).—Female, aged thirty-seven years. This patient had suffered from a number of conditions requiring surgical attention in earlier life. Among these was an acute appendicitis, for which she was operated on in 1904, and gastric ulcer, which was cured without operation. In 1905 she first began to suffer from intestinal trouble, which manifested itself by diarrhea, tenesmus, and blood in the stools. Examination then showed a tender sausage-

shaped mass in the left iliac fossa. In June, 1906, she was operated on, and a condition of retraction and contraction of the mesosigmoid, with many scar-like adhesions taking their origin from multiple diverticula of the sigmoid, was found. Separation of the adhesions, and straightening out of the intestinal coils gave relief for about two years, when the symptoms recurred. In March, 1909, a resection of the diseased portion of the sigmoid was done, and this has resulted in a complete cure up to the present time. The specimen consists of a section of the sigmoid, 12 cm. in length, hardened in formalin. After opening along the anterior border, inspection from the inside shows fourteen diverticula. These are all small, having a communication with the intestine, 0.5 cm. in diameter, and a depth of 0.5 cm. None showed marked evidence of inflammation. In the hardened specimen there is no evidence of their presence on the peritoneal surface of the gut. The whole intestinal wall, however, seems somewhat thickened. Microscopically, a longitudinal section through one of the diverticula shows the following: The mucosa lining the saccule is normal. The submucosa shows no changes. The circular coat of the muscularis is very much thinned over the fundus of the sac. The longitudinal layer maintains its normal thickness. The submucosa contains considerable fat tissue. In the region of the diverticulum it is infiltrated with a moderate number of polymorphonuclear leukocytes and lymphoid cells. The serosa is thickened. The intestine adjacent to the diverticulum is normal.

Case V.—The patient from whom this specimen was obtained was a male, aged forty-eight years. He died in the Bellevue Hospital from general metastases, following an epithelioma of the œsophagus. Nothing in the history gave any indication of a lesion existing in the sigmoid. There was no evidence of any cardiac trouble nor any condition leading to portal congestion.

The specimen consists of the lower end of the sigmoid, measuring 12 cm. in length, and containing six diverticula, all of which have a long, narrow neck, barely admitting a small probe, through which they connect with the lumen of the intestine. The diverticula are spherical in shape, and measure about 0.5 cm. in diameter. They are filled with semisolid feces. This feces, owing to the narrowness of the outlet, are practically prevented from reëntrance into the lumen of the bowel. The position of the diverticula is on either side, between the anterior and lateral teniæ. In some cases the diverticulum is in close relation to an appendix epiploica. In others, no such relation can be demonstrated. The thickness of the intestinal wall is distinctly greater in that portion where the diverticula are present than in that portion where they do not exist.

Microscopically, sections taken transversely through two different diverticula present the same picture. The mucosa is thick at the neck, but becomes thinned out in the fundus. The muscularis of the adjacent gut is hypertrophied, but only a small part of the longi-

tudinal layer passes about the diverticula, forming a thin strip of atrophied muscle between the mucosa and serosa. By the use of Van Gieson's stain, considerable fibrous tissue is found between the muscle fibrillæ about the diverticulum. The subserosa contains several fairly large bloodvessels, both arteries and veins, and a considerable quantity of adipose tissue. The serosa appears normal. There is no sign of acute or chronic inflammation in any part of the saccule.

CASE VI.—The specimen was removed from a male, aged seventy-five years, who died in the Presbyterian Hospital following a resection of the small intestine for gangrene in a strangulated hernia. The autopsy showed a general arterial sclerosis and a chronic endocarditis, but there was no evidence of congestion in the abdominal viscera. The specimen consists of a small section of the transverse colon, which presents one diverticulum. This arises from a plane midway between the anterior and one of the lateral tenia. It is exactly globular in shape, and measures 1 cm. in diameter. It communicates with the lumen of the gut by a circular opening, also 1 cm. in diameter. The sac of the diverticulum contains an elliptical enterolith about 0.5 cm. in its long axis and 0.25 cm. in its short axis. This, therefore, lies loose, and is not impacted. The walls of the diverticulum are distinctly thinner than the wall of the gut around it. This specimen was preserved intact, so that no microscopic sections were taken.

CASE VII.—The specimen was obtained from a boy, aged six years, who died in coma in the Presbyterian Hospital from an acute infectious condition of only twenty-two hours' duration. The only abnormalities found at autopsy by the coroner were those described below, under the specimen, and a condition of ulceration in other parts of the colon and lower ileum.

The specimen consists of a piece of colon showing three haustra. Each of these is more sacculated than normal. The specimen is opened along the mesenteric line. In one of the haustra the walls are distinctly thinner than in the others, and here exist two diverticular pouches, one on either side of the anterior tenia (Fig. 3). They are exactly similar, being globular in shape, and measuring about 2 cm. in diameter. Their communication with the lumen of the gut is by a circular opening of the same diameter. The condition, therefore, is more a giving way of the whole wall of the gut in an intermuscular portion than the presence of actual diverticula. The thickness of the wall in this weakened haustra is much less than in those adjoining it.

Microscopically, a section through the diverticulum, taken longitudinally, shows a small saccule lined with flattened mucosa, but completely surrounded by a muscularis, which consists of both the circular and longitudinal layers. Both layers are considerably thinner here than in the adjacent intestine, but in all other respects

they appear normal. The serosa and subserosa are normal. The intestine adjacent to the diverticulum is normal.

CASE VIII.—This specimen was obtained from a female, aged ten years, who died in the Presbyterian Hospital from a septic meningitis following otitis media. There was nothing in the history pointing to any intestinal trouble. At the autopsy nothing was found indicating any interference with the venous circulation of the abdominal viscera.

The specimen consists of a small piece of the sigmoid, which has been opened along the mesenteric line. There is one diverticulum present. Its communication with the intestine is oval, measuring 1 cm. in length and 0.5 cm. in width, the longer diameter being transverse to the axis of the gut. The pouch is about 0.5 cm. deep, and is of the same diameter as the opening into the intestine. There is no appreciable difference in the thickness of the wall of the diverticulum and that of the intestine about it. The position of the diverticulum is midway between one of the lateral tenia and the mesenteric line.

No relation to an appendix epiploica can be made out.

Microscopically, transverse sections through the diverticulum show the following changes: The mucosa lining the saccule is flattened. The submucosa is normal. The muscularis becomes rapidly thinner as it passes on to the diverticulum, but does not disappear entirely (Fig. 4). Over the fundus it has been largely replaced by fibrous tissue, and it is only in sections stained by Van Gieson's method that the atrophied muscular fibers, chiefly of the longitudinal coat, can be recognized. The serosa and subserosa are normal. There are no large vessels in the wall of the sac. The intestine adjacent to the sac is normal.

CASE IX.—This specimen was obtained at the autopsy in a female, aged sixty-five years, who died in the Presbyterian Hospital from chronic obstructive jaundice due to calculus, gangrene of the gall-bladder, and septic cholangitis. The heart was dilated, but there was no evidence of any disturbance of the circulation in the intestinal veins.

The specimen consists of a piece of the descending colon and sigmoid, measuring 60 cm. in length. In its lower half are counted fourteen diverticula, many of which are filled with fecal concretions. The average diameter of the opening into a diverticulum is 0.5 cm. The average length is 1 cm., and the fundus of the sac is usually about twice the diameter of the neck. Each diverticulum has its os lying in a plane midway between a lateral tenia and the mesenteric line, and the sac extends outward into an appendix epiploica. There is no gross evidence of any inflammatory thickening about the diverticula or in the intestinal wall adjacent to them. On the contrary, in those diverticula which are distended with feces, the fundus of the sac seems distinctly thinner than the rest of the gut wall.

Microscopically, transverse and longitudinal sections through the diverticula show no inflammatory changes. The mucosa is slightly flattened. The circular layer of muscularis becomes greatly thinned at the neck of the diverticulum, and soon disappears. A slender band of longitudinal fibers, containing considerable fibrous tissue, completely encircles the sac. The transverse section shows a large artery and vein in the subserosa of the fundus. The serosa is normal.

CASE X.—This specimen was obtained at the autopsy of a male, aged fifty-six years, who died in the Bellevue Hospital of acute lobar pneumonia. The clinical history gave no evidence of any intestinal lesion. Neither the clinical history nor the autopsy gave evidence that any chronic disturbance in the intestinal venous circulation had been present.

The specimen consists of a portion of the ileum. At one point opposite the mesenteric attachment there is a Meckel's diverticulum, measuring 9 cm. in length and 3 cm. in diameter throughout its length. On this diverticulum are distinctly seen four secondary diverticula, each about 1 cm. in diameter and 0.5 cm. in depth. There is a slight constriction near the middle of the large diverticulum, corresponding to the line of the obliterated vessel coming from the mesenteric border. On opening the intestine this pouch communicates with the lumen of the gut by a circular opening 2 cm. in diameter. The secondary diverticula can be seen opening into the large pouch.

CASE XI.—A male, aged sixty-six years, died in the Bellevue Hospital from general arterial sclerosis and cardiovascular disease. General anasarca was present and there was very severe congestion of all the abdominal viscera.

The specimen consists of the cecum and a portion of colon measuring 12 cm. in length. Five diverticula are present, varying from 0.25 cm. to 2 cm. in diameter. The larger ones are filled with hard, fecal masses (Fig. 5). The communication with the lumen of the gut is always smaller than the pouch of the diverticulum, but there is no neck. The expanded pouch around the mouth of the sac is thinned, and the wall of the pouch itself is distinctly thinner than the surrounding intestinal wall. The diverticula lie in planes between the mesenteric line and the lateral tenia on either side. One diverticulum is in the cecal pouch itself, and on the external surface lies 2 cm. external to the origin of the appendix vermiformis.

Microscopically, a section taken transversely through one of the diverticula shows the following: The sac is connected with the lumen of the intestine by a very small opening. The mucosa is reflected over the margin of this opening and lines the entire sac. The portion in the sac, however, is thinner than that lining the adjacent gut and is covered with a layer of structureless material. The submucosa is normal. The circular layer of the muscularis

surrounds the sac, but shows a marked thinning, and more or less replacement with fibrous tissue. The longitudinal fibers are not found in the wall of the sac. A large artery and vein lie in the subserosa of the fundus of the sac. The serosa and subserosa are normal. The intestine adjacent to the diverticulum is normal.

CASE XII.—The specimen was obtained from a male patient, aged sixty-eight years, who died in the Presbyterian Hospital from carcinoma of the prostate, bladder, and liver, the primary lesion being in the liver. There was no evidence at autopsy of any interference with the circulation in the intestinal veins.

The specimen consists of the whole large intestine. In the cecum there are three diverticula measuring 3 to 9 mm. in diameter. Surrounding them is a distinct area of inflammation. The transverse colon and sigmoid show an increasing number of diverticula, all small in size. The diverticula are distributed irregularly and show no definite relation to the mesentery or tenia. These diverticula vary in diameter from a few mm. to 1 cm. The entrance to the diverticulum is always much smaller than the lumen of the pouch itself. The wall of the descending colon and the sigmoid is much thickened by tissue in the middle layers of the wall. At one point this thickening is extreme, the wall measuring nearly 2 cm. in thickness. In this situation the diverticula are very numerous, being closely packed together. Microscopically, a section taken transversely through two adjacent diverticula in the sigmoid shows the following changes: The mucosa in both sacs is intact but infiltrated with a large number of small, round cells of the lymphoid type. The submucosa shows a similar infiltration. Over the fundus of one saccule the submucosa is necrotic and contains several large vacuoles which suggest that the tissue has contained gas. As there are no polynuclear leukocytes about this area, it is probable that the change is a postmortem one. The circular layer of muscularis has undergone considerable hypertrophy, a change which can be observed not only in the wall of the intestine between the diverticula, but in the lateral walls of the diverticula themselves. Over the fundi, however, the muscularis becomes thin. The longitudinal layer of the muscularis is not made out. At many points the muscularis of the sac wall is densely infiltrated with lymphoid cells. Large vessels occur in the subserosa of both saccules. The subserosa contains a good deal of adipose tissue and many lymphoid cells. The serosa is normal. Another section taken through one of the diverticula in the ascending colon shows no inflammatory changes, and no hypertrophy of the muscularis. A thin strip of the circular layer of muscularis surrounds the saccule.

CASE XIII.—The specimen (Museum specimen, Bellevue Hospital) consists of a portion of small intestine, 30 cm. in length. Seven small oval diverticula, varying in size from 0.5 to 1.5 cm. in diameter, occur along the mesenteric border between the folds of the mesentery,

but bulging more on one side than on the other. In each case a vein may be seen travelling from the convex border of the intestine in the subserosa, and passing directly over the diverticulum to reach the mesentery. This vein is always present only on the side toward which the diverticulum bulges. The leaves of the mesentery can be stripped off the diverticula.

On opening the gut, the communication between its lumen and the diverticulum is seen in each case to be smaller than the diameter of the diverticulum itself. Three additional openings are found communicating with diverticula too small to be identified from the external surface. The opening into the diverticulum is situated, in most cases, on one side of the mesenteric line. A few seem to correspond exactly to its line of attachment. The same relation of the diverticulum to the vein is manifest, and it is the course of this vein toward the mesentery that determines the direction of the growth of the diverticulum.

Microscopically, sections have been taken transversely through the gut at the site of one of the small diverticula. The mucosa and submucosa are everywhere normal. The muscularis extends down for some distance over the saccule, but is absent over the fundus. The longitudinal layer extends further down than the circular. It becomes gradually thinner and finally disappears. The serosa and subserosa are not thickened. There are no large vessels in the wall of the saccule. The intestine adjacent to the diverticulum is normal.

Case XIV.—The specimen (museum specimen, Bellevue Hospital) consists of a piece of small intestine 40 cm. in length, showing thirteen diverticula, varying in diameter from 0.25 cm. to 6 cm.; eleven of these are crowded together into a piece of intestine only 22 cm. long, so that there is practically no part of the mesenteric border free from a diverticulum. The same relationship between the diverticula and the mesentery and veins is present as described in Case XIII. The walls of the larger diverticula are somewhat thicker than those of the smaller ones. There is no communication between the individual diverticula even where they are close together.

Microscopically, a section taken longitudinally through the gut displays a portion of diverticulum of rather large size. The mucosa is flattened. The submucosa is normal. The two coats of the muscularis extend down over the saccule, but become much thinner at the neck. The circular layer becomes rapidly thinner and soon entirely disappears. The longitudinal layer appears to continue as a thin strip clear around the sac. The serosa and subserosa are normal.

Case XV.—The specimen (museum specimen, Bellevue Medical College) consists of several small pieces of colon showing diverticula packed rather closely together and varying in size from 1 cm. to 3 cm. in diameter (Fig. 9). They show the same general characteristics as the other specimens, but owing to the way in which the specimen has been mounted, the relation of the diverticula to the mesentery and vessels cannot be determined.

Microscopically, sections taken transversely through a small diverticulum show considerable postmortem change, but the different coats can still be made out. The mucosa and submucosa are normal. The muscularis, both the circular and longitudinal, extends up for some distance on either side of the neck, but becomes progressively thinner and soon disappears. Occasional bundles of the longitudinal fibers occur over the fundus. The serosa and subserosa are normal. No large vessels are found in the subserosa.

FIG. 9.—Diverticula of the colon, showing the openings of the diverticula into the gut. (Case XV.)

CASE XVI.—The specimen (museum specimen, Presbyterian Hospital) consists of the duodenum, which shows the presence of eight small diverticula, the largest measuring 1.5 cm. in diameter, all of which occur in close relation to the mesenteric attachment. All but one are situated in the portion of duodenum distal to the papilla of Vater. The general appearance and gross structure is the same as that described for those in other parts of the small intestine.

Microscopically, the diverticula were studied in transverse and longitudinal sections. The walls of the saccules are composed of normal mucosa and considerably thickened serosa. Both the transverse and longitudinal portions of the muscularis come to a rather abrupt ending at either side of the neck of the sac. There is a large artery in the subserosa of one of the saccules. The intestine adjacent to the diverticula shows no change.

CASE XVII.—The specimen (museum specimen, Bellevue Medical College) consists of a section of colon 10 cm. in length. On the two lateral aspects of the intestine are closely crowded together fusiform diverticula, from 1 cm. to 1.5 cm. in length and 0.75 in diameter (Fig. 4). The bases of the diverticula lie in two lines directly posterior to either lateral tenia. There is a distinct

interval of normal intestinal wall lying between the mesenteric attachment and the diverticula on either side.

On opening the intestine, each diverticulum is seen to communicate with the lumen by an opening somewhat smaller than the diverticulum itself. This inequality, however, is not nearly so marked as in some of the other specimens. In two instances, two diverticula communicate with the intestine by a common opening, the septum which originally separated them having in part disappeared. In each of these cases the two individual diverticula lie in an oblique, nearly transverse plane.

Microscopically, transverse and longitudinal sections through the diverticula present similar pictures. At one point the wall of the gut is greatly thinned out, and takes the form of a small saccule.

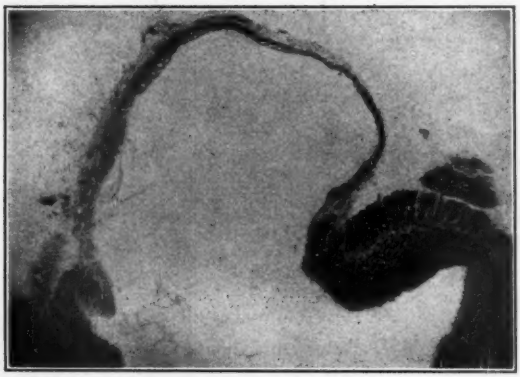

FIG. 10.—Microscopic section through a diverticulum. The muscularis terminates suddenly at the neck of the sac. The mucosa and serosa are greatly thinned. (Case XVII.)

The muscularis terminates suddenly on either side of the diverticulum, so that the wall of that structure is composed only of mucosa and serosa (Fig. 10). The former is very thin, and atrophic looking, the crypts having largely disappeared. The serosa is also quite thin. The intestine adjacent to the diverticula exhibits no changes. In neither the transverse nor the longitudinal sections can any large vessels be found.

CASE XVIII.—The specimen (museum specimen, Presbyterian Hospital) consists of a piece of small intestine, measuring 135 cm. in length. Thirty-three diverticula are present. They are all in close relation to the mesenteric border in their origin and pouch on either side beneath the mesenteric leaf (Fig. 1).

In nearly every case a large vein, and sometimes an artery, may be seen coursing over the pouch of the diverticulum. The intestine has

been preserved unopened, so that no description of the diverticula from the inside is given. They measure from 0.25 cm. to 6 cm. in diameter, all being of a globular shape.

Microscopically, a transverse section through one of the diverticula shows a small saccule opening into the gut through a narrow

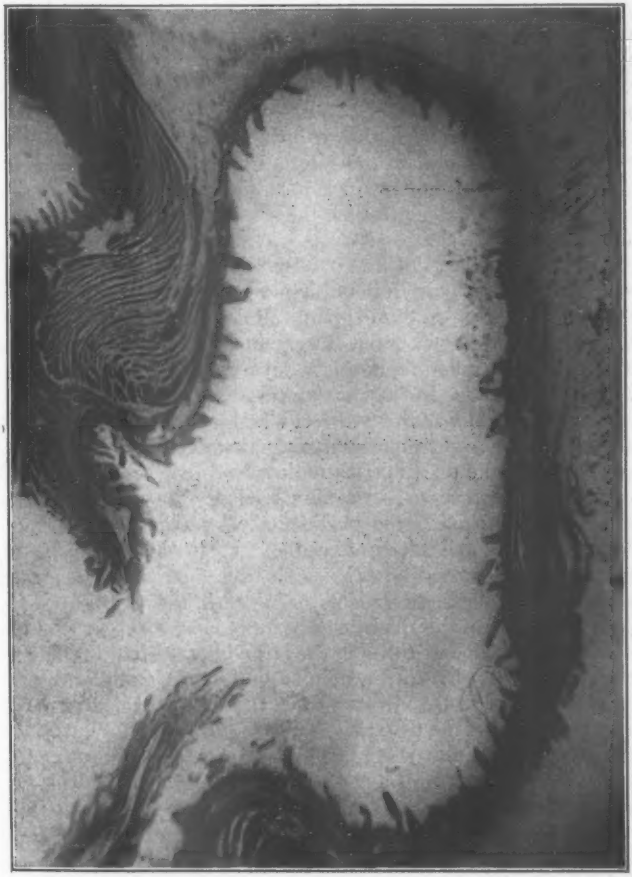

FIG. 11.—Microscopic section through a diverticulum, showing the artery and vein in the wall of the sac. (Case XVIII.)

opening. The wall of the sac is composed chiefly of the inner and outer coats of the gut, the longitudinal fibers of the muscularis extending down for only a short distance on either side as a thin strip. The mucosa and submucosa show no changes. The cross-sections of two large vessels—a vein and an artery—occur in the subserosa of fundus (Fig. 11). The serosa shows no perceptible thickening. A

longitudinal section through another diverticulum presents a very similar appearance. The muscularis, however, in this case, stops abruptly on either side of the neck of the saccule. A large vein is found in the subserosa. The intestine adjacent to the diverticulum in both cases appears normal.

SUMMARY OF REPORTED CASES. Four patients showed symptoms for which they underwent operation. Of these, three suffered from chronic symptoms, and were cured by operation; one suffered from acute obstruction, and was cured by operation. Eight specimens were obtained from autopsies on persons dead from causes not connected with the diverticula, and in none of them had any symptoms relative to this condition ever been present. The remaining six specimens were found in the museums, and no clinical or post-mortem data were obtainable.

Sex. Of thirteen cases in which the sex is given, ten were female and three were male.

Age. The two youngest cases were six and seven years old, respectively. Three were under thirty years of age, and six were over fifty. The ages of those giving clinical symptoms were between twenty-two and forty-three, thus demonstrating that neither the diverticulum nor its inflammation is solely a disease of advanced life.

The number of diverticula in each case was as follows: The least was one and the most was thirty-three, with an average of about ten. Location: Of the eighteen cases, seven involved the descending colon, or the sigmoid, or both; three involved the ascending colon; one involved the cecum; two involved the transverse colon; two involved the "colon," the particular portion not being given; four involved the small intestine, one of which was in the duodenum; one involved the wall of a Meckel's diverticulum. In five out of the eighteen cases, the diverticula occurred in the small intestine. In all but one of these the diverticula were in close relation with the mesenteric line. None of those in the large intestine was so placed, the greatest number, eight cases, being found between a lateral tenia and the mesentery. Only one was found in the convex border of the intestine. In three of the five cases occurring in the small gut, there appeared to be a definite relationship between the diverticula and the mesenteric veins. No such connection could be established in any of the cases occurring in the large gut. In only one was there any evidence that a venous congestion in the inferior mesenteric veins had been present during life, while in eleven this was absent. This is in direct opposition to the findings of Graser. In the remaining six no information on this point was obtainable.

Of the fifteen cases from which microscopic sections were cut, twelve showed more or less muscularis about the particular sac studied. In the other three cases, the fundus of the sac was composed of only the inner and outer coats of the gut, the muscularis terminating abruptly at the neck of the sac. In five of the twelve

cases in which a muscularis was demonstrated, both muscular layers were present. In five others, only the longitudinal coat survived. In the remaining two cases, only the circular coat could be demonstrated. By means of the Van Gieson's stain, traces of atrophied muscularis were found in several instances in which it had been overlooked in hematoxylin–eosin preparations. As a rule, we have found that the larger the diverticulum, the thinner and more atrophied is the muscularis. The circular layer is generally the first to disappear.

CONCLUSIONS. 1. Diverticulum of the intestine is a common condition.

2. The large bowel is the most frequent site, particularly the descending colon and the sigmoid.

3. Children and young adults are subject to diverticula, and to the secondary changes occurring in them.

4. All diverticula are probably true in their incipiency. The false characteristics are the results of their growth.

5. An inherent weakness existing in the muscularis is probably an important factor in the etiology of diverticula. In the small intestine this weakness appears to exist along the mesenteric attachment.

6. Diverticula undergo the same pathological changes as the appendix veriformis, and give rise to much the same general symptoms. These pathological changes are not uncommon.

We wish to express our thanks to Dr. Opie for the material from the museum of the Presbyterian Hospital; to Dr. Norris and Dr. Pappenheimer, for specimens from the Bellevue Hospital Laboratory; to Dr. Crowel, for specimens from the museum of the University and Bellevue Medical School; and to Dr. Moschowitz, for permission to include his interesting case in our series. We are also indebted to Drs. Leaming, Jachs, Agnew, and G. M. Smith, for photographs of the specimens.

SKIN RASHES IN TYPHOID FEVER.

BY JOHN PHILLIPS, M.B.,

ASSISTANT PROFESSOR OF MEDICINE IN THE WESTERN RESERVE UNIVERSITY, CLEVELAND, OHIO.

THE usual cutaneous manifestation seen in typhoid fever is the presence of rose spots in the form of a maculo-papular eruption appearing on the abdomen. The lesions are pale red at first, later become darker, and appear about the end of the first week, coming out in successive crops. They are usually few in number, but in some patients form a profuse eruption, covering the entire body and extremities, and are occasionally seen on the face. Sometimes the lesions are capped by tiny vesicles, at other times they are hemorrhagic. The other cutaneous lesions seen in typhoid form a very

interesting group. Among these may be mentioned herpes, urticaria, sudamina, desquamation, erythema, erysipelas, purpura, furunculosis, abscess, carbuncle, impetigo, onychia, infected sebaceous cyst, decubitus, tache bleuâtre, and lineæ atrophicæ. The following description of these conditions is based on a review of the literature, and on a study of their occurrence in 1230 cases of typhoid fever, occuring in the medical services of Drs. Powell, Lowman, Upson, Cushing, and Hoover, at Lakeside Hospital; to these gentlemen I am indebted for the privilege of making this report.

Herpes were observed in 12 cases. In 8 cases they appeared on the lips during the first week of the disease. In the other 4 cases the herpetic eruption appeared late in the course of typhoid and in various regions of the body. In 1 case, a female, aged thirty-two years, a number of vesicles appeared on the forty-fourth day of her illness, a short distance outside the external canthus of her left eye and also directly above this near the hair line. Another patient, a boy, aged fifteen years, on the thirty-third day of the disease, had a small patch of herpes develop on the lower part of his chin, to the right of the median line. The third case, a male, aged fifty-two years, was afflicted with herpes over the left malar bone on the thirty-first day of his typhoid. In the fourth case, a male, aged twenty-nine years, symmetrical patches of herpes appeared on the inner and outer side of each knee, the patches on the left being more extensive. Many think that the presence of herpes labialis excludes the diagnosis of typhoid fever. That this is incorrect is shown by the 8 cases mentioned above. McCrae[1] found 20 cases of herpes in his series of 1500 patients with typhoid fever. Zinn[2] met this condition in 5 per cent. of 190 cases in the hospital at Nuremberg.

Urticaria was present in 21 cases. In some the urticarial eruption developed as a few scattered wheals on the chest or abdomen, preceding the appearance of the rose spots; in other cases it appeared later in the disease. Occasionally the lesions may cover the greater portion of the body and extremities. Miller[3] found urticaria in 2 cases in his series of 350 patients. It was formerly thought to be due to the administration of quinine, but this drug was not used in any of our patients.

A miliary eruption of sudamina is a very frequent occurrence in the third and fourth week of typhoid, when sweating is profuse. They are due to the retention of sweat drops beneath the epithelial layer of the skin. De Lacaze[4] believes that sudamina possess a definite prognostic significance. When they appear in the third or fourth week they indicate the entrance into active convalescence. My experience confirms this statement. They are usually seen on

[1] Modern Medicine, edited by Osler and McCrae, ii, 117.
[2] Münch. med. Woch., 1895, xlii, 486.
[3] International Clinics, vol. iii, Sixteenth Series, p. 60.
[4] Revue de méd., 1887, p. 275.

the chest and abdomen and in some cases present a striking appearance as though the skin was covered with tiny drops of water. Sudamina were present in 11 of a series of 100 cases in which a careful watch was made for this condition. Sometimes as a result there is profuse desquamation.

Quite extensive desquamation of the skin was noted in 83 patients. Riesman[5] has classified desquamation under the following heads: (1) Following vesicular rose spots, (2) as a result of sudamina, (3) an atrophic change analogous to shedding of hair, which usually appears in cases with severe fever. To this I would add a fourth, which would include those cases of desquamation which follow an erythematous eruption in typhoid. Rolleston[6] has reported a remarkable case of desquamation of the skin in large flakes in typhoid fever in a boy, aged ten years, who, on the fourteenth day of illness, had peeling of the skin off the thorax, thighs, and abdomen in flakes the size of a shilling. His heels and toes peeled in small scales. No cause for the peeling could be ascertained. Diehl[7] has reported an interesting case of exfoliative dermatitis in a male, aged eighteen years, who, during convalescence from an attack of typhoid fever, had a rash, consisting of minute, pin-head sized, bright red papules, appear on the wrists, and later spread to the dorsal surface of the hands and forearms up to the elbow. Later it spread to the feet, legs, and body. Intermingled with these lesions were a number of blebs the size of a half dollar. Desquamation followed in the order in which the eruption appeared.

Of the accidental skin rashes in typhoid, probably none has received as much attention as the erythemas, because of the close resemblance at times to scarlatina and the resulting difficulties in diagnosis. The first to call attention to the scarlatiniform erythema in typhoid was Murchison,[8] who stated that in many cases of enteric fever the appearance of the rose spots is preceded, for two or three days, by a delicate scarlet rash, all over the body, disappearing on pressure. He mentions the fact that Jenner relates an instance in which this rash coexisted with slight sore throat, and the disease was mistaken for scarlet fever. Murchison states that several similar instances had come under his own observation, and even goes so far as to assert that scarlet fever appears to predispose to typhoid fever. Various other writers—Graves,[9] Ohmann-Dumesnil,[10] Moore,[11] Osler,[12] Griffiths,[13] Russell,[14] Fisher,[15] and Da Costa[16]—have called

[5] Amer. Jour. Med. Sci., January, 1904.
[6] Trans. Clin. Soc., London, 1889–1890, xxiii, 84.
[7] Jour. Cut. and Genito-urin. Dis., 1898, xvi. 222.
[8] Treatise on Continued Fevers of Great Britain, second edition, 1873, p. 515.
[9] Medical Record, 1890, xxxvii, 118
[10] Jour. Amer. Med. Assoc., 1890, xv, 164.
[11] Dublin Jour. Med. Sci., 1888, lxxxvi, 497.
[12] Johns Hopkins Hospital Reports, "Studies in Typhoid Fever," i, ii, iii, 471.
[13] Lancet, 1893, ii, 1307.
[14] Lancet, 1896, i, 766.
[15] Brit. Med. Jour., 1893, i, 794,
[16] Trans. Assoc. Amer. Phys., 1899, xiv, 89.

attention to the presence of a scarlatiniform erythema in typhoid. The bright red eruption may be limited to the flexor surfaces or it may cover the entire body, as in one of my cases. As a rule, there is no involvement of the throat, although Da Costa has reported a case in which there was some soreness and redness of the throat. This, as a rule, has no particular significance, as occasionally the onset of typhoid is ushered in by tonsillitis. Whipham[17] has recorded a similar case in a male, aged thirty-six years, who, on the fourteenth day of his illness, developed a sore throat, with a bright erythematous eruption over the entire trunk and a less definite rash on the legs and arms. He died four days later, but his erythema had almost entirely faded before his death. Moore attributes the development of the scarlatiniform eruption, when it appears early in the course of typhoid, to a reactive inhibition of the vasomotor system of nerves; when it appears in the third week to a septicemia or secondary blood poisoning. The diffuse erythemas are usually present in the severe toxic cases, and it seems to me that they are due to an attempt of nature to get rid of the toxins through the skin; these irritate the skin, producing an erythema just as one sees in uremia, septicemia, or in cases of intestinal auto-intoxication. In reviewing the cases of this character published in the literature, one is surprised at the number that are fatal. Seven of the cases in our series showed erythema; in one it was of the type of erythema multiforme, which developed on the back and about the buttocks. Osler[18] has reported one case of erythema nodosum, in which the characteristic eruption on the legs appeared on the fifteenth day of typhoid fever.

A number of cases have been reported in which true scarlet fever has developed during the course of typhoid. Sequeira[19] and Caiger[20] each have met with two such cases, and Payne[21] with one case. Griffiths[22] had the remarkable experience of seeing four children in one family who were attacked by both diseases, the onset of both fevers being almost simultaneous. Cosgrove[23] has reported five cases in which the two diseases occurred in the same individual. Carmichael[24] mentions the case of a boy, aged six years, who, after suffering from scarlet fever and going on to the stage of desquamation, continued febrile from oncoming typhoid fever. Coombs[25] and Gabe[26] have each reported a similar case.

Closely allied to the cases of typhoid complicated by erythema are those which show a rash resembling measles. Instances of this kind have been reported by Beevor,[27] Neumann,[28] and Da Costa. Beevor's

[17] Trans. Clin. Soc., London, 1882–1883, xvi, 150.
[18] Johns Hopkins Hospital Reports, "Studies in Typhoid Fever," p. 473.
[19] Brit. Med. Jour., 1891, i, 586.
[20] Lancet, 1894, i, 1137.
[21] Ibid., 1894, p. 1264.
[22] Ibid., 1893, ii, 1307.
[23] Brit. Med. Jour., 1897, i, 29.
[24] Lancet, 1894, i, 246.
[25] Brit. Med. Jour., 1897, vol. i.
[26] Ibid., p. 848.
[27] Ibid., 1883, i, 956.
[28] Centralbl. f. klin. Med., 1890, xi, 465.

patient was a probationer nurse, who, on the third day of her typhoid, had a morbilliform eruption appear on her feet, legs, chest, and upper extremities. There was no coryza or conjunctivitis, nor was the arrangement of the lesions crescentic. These two facts and the appearance of the eruption on the body in a different sequence from that seen in measles, would assist in making a correct diagnosis. In this case the rash gradually faded and was not followed by desquamation. In Neumann's patient the morbilliform eruption appeared in the third week; Da Costa's two cases also developed the rash late in the course of typhoid. The co-existence of typhoid fever and measles in the same patient has been reported by Chrystie,[29] Matiegka,[30] Ringer,[31], Ringwood,[32] and Da Costa. In the two cases reported by Da Costa there was a definite history of exposure to measles, the eruption showed the characteristic crescentic arrangement, and was preceded by coryza and conjunctivitis.

In six cases purpura was noted. One of these, a girl, aged eighteen years, developed on the twenty-third day of typhoid a purpuric spot on the second toe of the left foot; this was followed by a number of petechiæ on the outer side of both feet. A few days afterward she had hematuria and menorrhagia. She succumbed from weakness and toxemia two weeks later. Four other patients had, in the third and fourth week of the disease, petechial spots appear on the lower extremities. I have not included here the cases in which there were hemorrhagic rose spots; this condition is not very uncommon. The sixth case of purpura is so remarkable that I shall give it in detail. This patient, a female, aged eighteen years, was admitted to Lakeside Hospital May 9, 1903, with a typical history of typhoid fever, with rose spots, enlarged spleen, and a positive Widal reaction. On the sixth and seventh days after admission she had two copious intestinal hemorrhages. At the same time several large purpuric spots appeared on the abdomen—one just above the pubis and another at the site of an old appendiceal scar being much larger than the others. There were also a few petechiæ over the anterior surface of the left ankle, one over the second toe of the left foot and a small ecchymosis over the great toe of the right foot. The patient complained of some burning in the ecchymotic areas of the abdomen. This was relieved by the application of hot compresses. In the course of a few days the ecchymoses on the abdomen became much darker in color, and at the end of a week a central slough had separated, leaving a ragged ulcer in the region of McBurney's point, and another just above the pubis (see Fig. 1). The patient died three weeks after admission from toxemia.

Such superficial gangrene of the skin is very rare. Taupin[33] mentions a case of sloughing of the thighs, sacral region, knees, elbows,

[29] Univ. Med. Mag., December, 1888.
[30] Prager med. Woch., September 25, 1889.
[31] Lancet, June 30, 1889.
[32] Ibid., July 7, 1889.
[33] Jour. des Con. méd.-chir., 1839, No. 7 (quoted by Hare and Beardsley, p. 177).

and of the face, in a child with typhoid fever. The skin became violaceous in appearance, and mortified, and this was accompanied by increase in the delirium. Hare and Beardsley[34] have reported a case in which the gangrene developed on the inside of the left calf of a girl, aged nineteen years, who had suffered some days before from a series of profuse hemorrhages. Two brown ecchymotic spots formed on the heels, but did not slough. The separation of the slough was accompanied by loss of power and sensation in the anterior part of the leg, evidently from peripheral neuritis. A very extraordinary series of ten cases of gangrene of the skin has been reported by Stahl,[35] which occurred in soldiers. Two cases in children have been reported by Jacobi,[36] and Abt.[37] McFarland[38] has also reported a series of patients in which gangrene of the skin resulted from typhoid fever. Nicholls[39] has recorded four cases in which late in the disease the hemorrhagic diathesis developed, the patients having hemoptysis, hematemesis, and hemorrhages from the bowels. A somewhat similar instance is reported by Hughes and Levy.[40]

In four patients a pemphigoid eruption was present. In one, a girl, aged seven years, a single large bleb appeared on the dorsum of the right hand. Cultures from the contents of the bleb showed Staphylococcus pyogenes aureus. In a second case a large bulla, surrounded by a red areola, appeared on the left shin, below the knee. The third case had two bullæ, one on the dorsum of the left hand, the other in the left axilla. In the fourth patient there were two bullæ, the size of a dime, on the right buttock. In all these patients the eruption appeared in the third and fourth week of the typhoid. Osler[41] has reported one similar case.

Two cases of erysipelas occurred in this series. This complication is seen late in the course of a typhoid, when the resistance of the patient is very much reduced. The first patient, a man, aged twenty-seven years, developed during the third week of his typhoid an erysipelatous eruption on the cheeks, with a marked rise in temperature, chills, and leukocytosis. The eruption spread over the face and scalp, and after running its usual course, he recovered. The second patient, a male, aged twenty years, in the fourth week of typhoid fever, following a purulent otitis media, was afflicted with erysipelas, beginning over the right parotid. It spread so as to involve the face and the greater part of the scalp. He made a good recovery.

Curschmann[42] claims that the principal reason that erysipelas is

[34] Typhoid Fever and Exanthemata, second edition, 1909, p. 177.
[35] Quoted by Hare and Beardsley, p. 178.
[36] Arch. Péd., December 15, 1899.
[37] Jour. Amer. Med. Assoc., 1901, xxxvii, 445.
[38] Quoted by Hare and Beardsley, p. 179.
[39] Montreal Med. Jour., June, 1906.
[40] Arch. de méd. et de phar. mil., August, 1892 (quoted by Hare and Beardsley, p. 179).
[41] "Studies in Typhoid Fever," Johns Hopkins Hospital Reports, p. 476.
[42] Nothnagel's Encyclopedia of Practical Medicine, Typhoid and Typhus Fevers, 1901, p. 324.

more common late in the course of typhoid, and during convalescence, resides in the fact that at this time bedsores and other ulcerative processes form a favorable starting point for this complication. Among 1420 cases Liebermeister[43] saw erysipelas occur in ten. Of these, eight had facial erysipelas; in the other two, the disease developed about bedsores. Griesinger[44] noted fatal erysipelas in 2 per cent. of 500 cases observed at Zurich. Hare and Beardsley[45] have reported three cases of facial erysipelas in women, complicating typhoid, that occurred within a period of six weeks of each other in the wards of St. Agnes' Hospital. The first case was separated from the second by an interval of five weeks, and the second from the third by less than a week. They were all in the same ward but occupied beds at least twenty feet apart. They all made a good recovery. In one there was chronic suppuration of the middle ear. In the collected statistics of Hare and Beardsley erysipelas was found recorded sixty-four times in 3910 typhoid patients, which is about 1 to 61, the proportion given by Gerente. Other interesting cases of this complication have been described by Thielman,[46] Berthoud,[47] Armiex,[48] Freudenberger,[49] Potain,[50] and Martine.[51] Silverstrini[52] has reported two cases of facial erysipelas in typhoid fever, in which the inflammation was found to be due to the bacillus of Eberth, and not to streptococci.

There were twelve cases of bedsores. Their most frequent site is over the sacrum, although they may be found over the occiput, the vertebral spines, the spine of the scapula, the great trochanter, the tuberosity of the ischium, and even over the heels. In some of our cases the bedsores were present on admission, owing to lack of careful nursing at home. In others the patients had severe intestinal hemorrhages, so that for a few days they were moved as little as possible. It seems to me that often more harm is done by keeping the patient in the dorsal position after a hemorrhage than would result from careful movement, because of the frequent development of bedsores. In very toxic cases they are likely to occur because of the involuntary micturition and defecation.

Under the heading of septic conditions of the skin there were noted in this series 45 cases of furunculosis, 2 of carbuncle, 5 of onychia, 9 of abscess, 1 of impetigo, and 1 of infected sebaceous cyst of the head. These cutaneous infections appear in the late stages of typhoid, when the course of the disease has been much protracted and when the patient's vitality has been considerably reduced. Edsall[53] has described a series of cases of typhoid in which furunculosis occurred

[43] Quoted by Hare and Beardsley, p. 253.
[44] Quoted by Curschmann in Nothnagel's Encyclopedia, Typhoid and Typhus Fevers, p. 325.
[45] Typhoid Fever and Other Exanthemata, second edition, Lea & Febiger, 1909, p. 253.
[46] Quoted by Hare and Beardsley, p. 257. [47] Ibid., p. 258. [48] Ibid., p. 257,
[49] Ibid., p. 258. [50] Ibid., p. 259. [51] Ibid. [52] Ibid,
[53] Univ. Penna. Med. Bull., March, 1904.

about the buttocks, the infection evidently being spread by the bed-pan. I have been unable to establish a similar method of infection in any of our cases. Carbuncles were present in two cases, in both of which they occurred during the stage of convalescence. In the one instance the carbuncle was situated on the outer side of the left leg, a short distance above the ankle; in the other, on the back in the lumbar region. Hare and Beardsley[54] mention one case in which the patient had a carbuncle on the back, which appeared about the twelfth day of an attack of typhoid, and persisted during a relapse and well into the second convalescence.

There were five cases of onychia; with one exception, these were in children. They are very painful, but heal readily with proper treatment. Abscesses were present in nine patients; these were in various situations over the lower third of the tibia, in the ischio-rectal fossa, in the vulvo-vaginal, gluteal, axillary, alveolar folds, in the groin, and in front of the right ankle. They are usually subcutaneous, but in some cases they may extend into the muscles. Impetigo was seen in one case. In another patient there was an infected sebaceous cyst of the head.

Another form of skin manifestation in typhoid is the tache bleuâtres, which Hare and Beardsley state were first described as occurring in typhoid by Piednagel, in 1837. The majority of observers will agree with Hewetson,[55] that they are usually, if not always, associated with the presence of pediculi. I have seen them in dispensary patients suffering from conditions other than typhoid, but in whom pediculi were present. They are steel-gray spots, 4 to 10 mm. in diameter, of irregular outline, and most abundant about the chest, abdomen, and thighs.

A very unusual lesion of the skin in typhoid is the development in children and young adolescents, especially when the disease has run a very long course and when the growth in height of the patient has been very rapid, of striæ patellares. A very interesting case of this kind came under my observation. A boy, aged fourteen years, was admitted to Lakeside Hospital May 16, 1906, suffering from a severe attack of typhoid fever. The disease ran a very long course, the complications being bronchitis, intestinal hemorrhage, and relapse. During his prolonged stay in bed he became very emaciated. He lay the greater part of the time with his knees slightly flexed and the toes extended, so that the skin was stretched. On July 2 he called our attention to some reddish scars, which were irregularly situated, in front of his knees and ankles, and appeared as if a superficial incision had been made, leaving the edges gaping open. On the anterior surface of the lower third of the leg there were in all nineteen of these scars, irregularly placed, the lowest being on a

[54] Typhoid Fever and Other Exanthemata, second edition, 1909, p. 177.
[55] Johns Hopkins Hosp. Bull., v, 19.

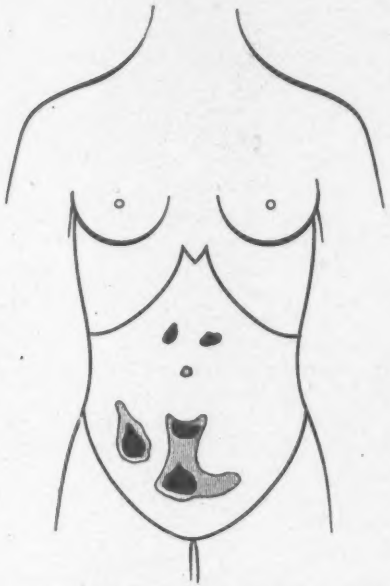

FIG. 1.—Showing the areas of ecchymoses on the abdomen. The darker areas represent the ulcers after sloughing.

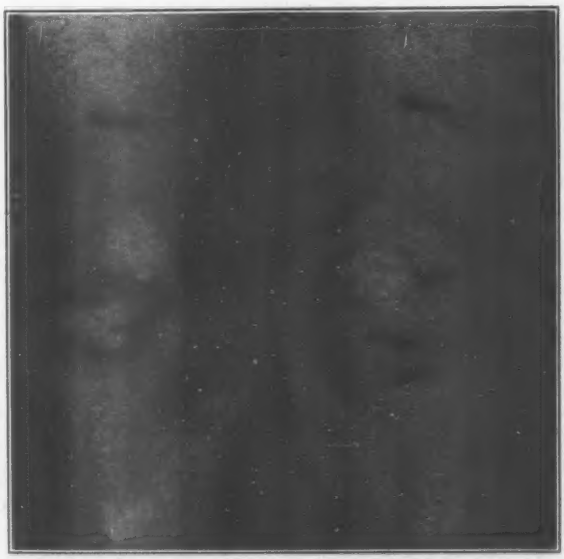

FIG. 2.—Showing the striæ about the knees.

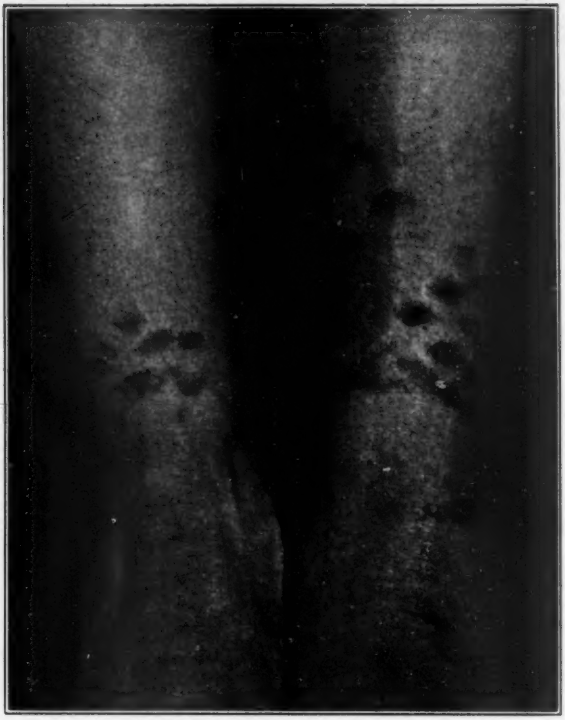

FIG. 3.—Showing the striæ above the ankles.

FIG. 4.—Showing white, irregular, transverse scars above the patellæ.

level with the tip of the internal malleolus, the highest 14.5 cm. above this point. They lay transversely, and varied in length from 1 cm. to 3 cm. The average width of the striæ was 9 cm. Directly over the centre of the patella, and extending transversely, was one of these striæ, 2.5 cm. in length, 0.25 cm. in width. In the median line over the anterior surface of the lower part of the thigh, 7 cm. above the transverse scar over the centre of the patella, was a linear transverse scar, 2 x 0.5 cm. in size. Three others of varying length were situated below the one over the middle of the patella. In all there were twenty-four of these lesions on the left extremity. On the right there were eighteen striæ, situated in positions similar to those on the left, making a total of forty-two. The positions of these striæ are seen in the accompanying pictures (Figs. 2 and 3). They were a delicate pink color, in marked contrast to the surrounding skin, and were painless, causing the patient no inconvenience whatever. There were no sensory disturbances in this case. During the patient's prolonged stay in bed he grew about four inches in height, and it seems to me that the most reasonable explanation of the striæ is the stretching of the skin from the rapid growth, the vitality of the tissues being much lowered. The occurrence of the lesions in the situations referred to was due to the fact that here, from the partially flexed position of the knees and the extension at the ankles, the skin was on a tension, and, besides, the growth is very rapid at the epiphyses of the long bones.

After seeing this case, I inspected the knees, for the presence of these scars, of every patient admitted to the medical wards. Four months later I was rewarded by finding them in front of the knees of a woman, aged forty-two years, admitted for a chronic condition, and who, when fifteen years old, had been afflicted with a severe and prolonged typhoid. She had a series of white, irregular, transverse scars just above the patellæ (Fig. 4).

This unusual condition of patellar striæ was first described by Wilks[56] in the case of a lad who had been confined to bed for the greater part of the time for six years, with disease of the knee-joint. He had three transverse stripes of a pale color in front of his knee, appearing as if a piece of skin had been removed and the edges never approximated, or as if a single incision had been made and the wound, gaping open, had been filled up with some loose texture. Over the instep of the right foot were several transverse scars lying parallel with one another. Similar but less distinct scars were found on the dorsum of the left foot. No mention was made of typhoid fever in this case. Bradshaw[57] records the case of a girl, aged thirteen years, who had a severe attack of typhoid, with two relapses. On the ninety-eighth day, because of some difficulty in walking, he

[56] Guy's Hosp. Reports, vii. 1861.
[57] Liverpool Medico-Chirurgical Journal, July, 1888.

was led to examine the lower extremities, and found over the anterior surface of the lower third of the thighs and the patella five or six horizontal markings, the longest reaching to about one-third the circumference of the limb, and being about half an inch in width. The smallest was under an inch in length and narrow in proportion. On flexing the knee the pink portions became smooth and shiny. On placing the finger on the markings a distinct depression was felt, as if there were a crack in the true skin, filled up with a thin layer of cuticle. There were no sensory disturbances in this case.

Shepherd[58] records the presence of these striæ in a boy, aged fifteen years, with typhoid, which ran a long severe course, and was complicated by double parotitis, with paralysis of the right facial nerve, paresis of the lower limbs, and fits of an epileptic character, with a mild form of dementia. Two months after admission he had well marked striæ over both patellæ and above both knees, purplish in color and elliptical in shape, tapering to a fine point at each end. The largest was six inches in length and half an inch in breadth at the middle. Troisier[59] has noticed this complication in young adults and children. Northrup[60] describes and figures the striæ above the knees in a lad, aged seventeen years, after a protracted course of typhoid. He said they were at first reddish, like "welts made by a switch." Fisher[61] has recorded a case in which the striæ developed above the knees after typhoid in a girl, aged thirteen years. Sir Dyce Duckworth[62] records unilateral striæ on the thighs in a patient, aged fifteen years, following typhoid. In this case there was accompanying hyperesthesia in the distribution of the external and middle cutaneous nerves. Köbner[63] reports two cases in girls, aged thirteen and fourteen years, with the characteristic lesions in front of the knee. One of these cases he saw twenty-three years afterward, and she was found to have broad white scars at the site of the lesions. Other cases of patellar striæ following typhoid have been described by Barie,[64] Kaposi,[65] Langer,[66] Gubler,[67] Bouchard,[68] Nonne,[69] and Bunch.[70]

As seen from the descriptions given above, the most frequent site for these lesions is over the lower part of the anterior surface of the thigh and in front of the patella, though they may occur in other parts of the body and in other conditions besides typhoid. This Pflagge[71] has noticed them, after typhus fever, occurring on the abdomen, where there had been no distention of the parietes. They

[58] Trans. Amer. Dermat. Assoc., 1890, xiv, 23.
[59] Bull. et mem. de la Soc. méd. des hôpitaux, 1889, No. 12.
[60] Trans. Assoc. Amer. Phys., 1903.
[61] Münch. med. Woch., 1904, 482.
[62] Brit. Jour. Dermat., 1893, p. 357.
[63] Münch. med. Woch., 1904, p. 928.
[64] Sem. méd., 1888, p. 259.
[65] Diseases of the Skin, Hebra, vol. iii, 262.
[66] Anzeiger der k. k. Gesell. der Aerzte in Wien, No. 28, 1879.
[67] Quoted by Bunch, Brit. Jour. Dermat., 1905, xvii.
[68] Ibid.
[69] Ibid.
[70] Brit. Jour. Dermat., 1905, xvii.
[71] Zeitschr. f. die Staatsarzneikunde, 1861, xv, 369.

have been noted even on the arm and over the knuckles of the hand (Barie). Bucquoy[72] has stated that in boys these lines may have no special areas of distribution, but in girls the breasts and crests of the ilium are the places where they usually appear. With this statement I cannot agree, as no such cases have occurred in over 1300 cases of typhoid treated at Lakeside Hospital. My own case is the only one in which extensive lesions have been described over the anterior surface of the lower part of the leg and in front of the ankle. Striæ have also been described in phthisical patients and in children suffering from colitis. They always leave permanent scars because the true skin is affected.

Many causes have been given for their appearance. Barie, because there was an accompanying herpes zoster in his case, considers this conclusive of their nervous origin. In support of this Sir Dyce Duckworth found hyperesthesia of the skin in the distribution of the middle and external cutaneous nerves in his case. The most reasonable and probable explanation is that given by Bunch and others, that they are due to the stretching of the skin from excessive growth of the long bones, either from want of pressure on the epiphysis or from a juxta-epiphyseal osteitis. Bunch states that the histological changes found consist in a diminution in the interlacing of the elastic fibers and a thinning of the white fibrous tissue. The elastic fibers show a parallel arrangement which has been brought about at the expense of the crossing transverse elastic fibers which have ruptured and retracted to the edge of the lesion. In the centre of the lesion, therefore, the total number of elastic fibers was less than that found in healthy skin, and those were more or less parallel to one another. At the edge of the lesion were the broken ends of the missing elastic fibers which had retracted, and the elastic tissue here appears denser than normal. In the pars reticularis of the corium these changes were best marked, and the more slender fibrils of the elastic network seemed to have suffered most. The branching fibrils which surround the sweat glands and hair follicles tend, no doubt, when dragged upon, to cause a deflection of these glands and follicles. Troisier and Menetrier[73] have also described an alteration in the course of the bloodvessels due to the same cause, but the sections of Bunch did not show this. In addition to these changes in the corium, there was slight thickening of the prickle cell layer, but the lesion was essentially one involving the corium more than the papillary layer and prickle cells. There was some round-cell infiltration around the bloodvessels. Kaposi, however, has examined the skin in those cases and found the epidermic layer and the mucous layer much atrophied. The papillæ had entirely vanished. Langer asserts that these lesions are not due to rupture but to disarrangement of the connective tissue. The connective tissue

[72] Quoted by Hare and Beardsley.

[73] Arch. de méd. expér., 1889, p. 134.

bundles form rhomboid meshes which, when the integument is distended, stretch most readily in the long axis. He says the striæ are the result of violent stretching, the bundles in part becoming parallel and remaining in position.

EXTENSIVE SARCOMA OF THE HEART, INVOLVING THE BUNDLE OF HIS.

By Charles F. Martin, M.D.,
PROFESSOR OF MEDICINE IN THE MC GILL UNIVERSITY; PHYSICIAN TO THE ROYAL VICTORIA HOSPITAL, MONTREAL,

AND

Oskar Klotz, M.D.,
PROFESSOR OF PATHOLOGY IN THE UNIVERSITY OF PITTSBURG, PENNSYLVANIA.

(From the Pathological Laboratory of the Royal Victoria Hospital, Montreal.)

Whatever be the real causation of the heart beat, and through whatever agency the rhythm of the heart is maintained, there is no doubt that recent studies of the anatomy of the heart itself have thrown considerable light on the subject, and the work of Tawara, His, Keith, and many others, has led one to believe that the explanation is nearing a solution.

Passing from the earlier authorities, whose views as to the heart's action were based on a belief that the blood itself, circulating through the chambers, was responsible for the individual beat, we were brought to consider the heart tissue as having some special function whereby the action, more or less automatic, was maintained in the absence of external control. When, however, the researches of anatomists and neurologists led us to see that ganglion cells and nerve fibers were present in abundance, the so-called neurogenic theory took its place as of paramount importance, and the heart's action was regarded as primarily subservient to the nervous mechanism of the body—the ganglia in the heart tissues originating the individual beats. Gaskell's researches, however, led to the myogenic theory, according to which the muscle cells themselves were possessed of a power independent of the nervous system, and by means of which stimuli originated and conduction and contractility were maintained.

When, however, ten years later (1893), Kent and His demonstrated special muscle bundles leading from the right auricle to the two ventricles, and with the further work of Keith, Flack, Erlanger, Gibson, Mackenzie, and many others, it was shown that the various functions of irritability, contractility, and conductivity depended in no small degree on the integrity of these muscular strands, a new

light was thrown on the whole subject of cardiac rhythm. In cases of myocardial disease with arrhythmia it was frequently demonstrated that the course of these fibers was disturbed by anatomical lesions of the bundles, and that when this existed the causation was attributable to this localized pathological change.

It remains, however, yet for physiologists and anatomists to determine whether or not the circulatory changes in functions thus induced are, after all, merely to be associated with muscular change, for in more recent times Pankul, working under Kronecker, found in the very bundles of His, running throughout their substances, nervous plexuses, injuries to which might readily account for any functional disturbance in which conductivity of the fibers exists.

Quite recently Wilson has again demonstrated that the atrioventricular bundle contains not only a special form of muscle fiber, distinct from the ordinary myocardium, but that it is an important and intricate nerve pathway, in which are found: (1) ganglion cells, (2) nerve fibers, and (3) nerve plexuses in close relation to the muscle fibers of the bundle.

It is obvious, then, that the exact relation of the bundles to cardiac rhythm requires more elucidation, and that while possibly, and even probably, the explanation lies in the altered condition of some tissues in these muscles strands, yet the whole explanation is not complete.

That such is the case is even more emphasized by an opposite state of affairs, that is, when, with more or less complete destruction of the bundles of His, no change in cardiac rhythm is observed. Such a case has come to our notice, and the interference of conductivity seems so probable that it may be cited as a very fair type of case, which might illustrate the possibility of some other factor yet unknown which is either responsible for the control of the heart's action, or which, in the absence of the usual means of exercising this function, may take up the work and maintain the regularity of the heart's action.

Extracts from Dr. Tull's Case Report:

A bank clerk, aged twenty-three years, was admitted on October 19, 1907, to the Royal Victoria Hospital, complaining of swelling of the face, feet, hands, and scrotum, and of shortness of breath. He was well until the end of April, 1907, when he suddenly fainted while sitting at his desk. He was unconscious only a few seconds, and remained for five or six days. He had had a cough and spat up a fair quantity of mucus, but no blood. His doctor thought his right lung was involved (tuberculous), and sent him to a hospital, where he remained ten days, and then after one week at home, he went to the mountains. There he remained from the middle of May to July, 1907. While there he began to have urgent dyspnœa on slight exertion. If he walked upstairs he was very dyspnœic, as also at night. With the dyspnœa there was cardiac palpitation, and his pulse varied from 100 to 140. No œdema or urinary disturbance

was present at this time, and his cough was less troublesome. He returned to Montreal in July and was seen by one of us (Dr. Martin), who examined him under the *x*-rays, and found a large intrathoracic tumor mass. He went home for the summer to Prince Edward Island to rest; he kept fairly well, except for attacks of dyspnœa, until August, when his throat began to swell, and he had some dysphagia. His doctor did some minor operation on his throat, which relieved this symptom. Toward the end of August his left arm suddenly became swollen, and has remained so, more or less, up to the time of admission. About this time, too, his face began to be swollen in the mornings; no headache was present. Three weeks later his feet began to swell, and were very œdematous at night. At this time he had pain down his sternum, and especially just to the right of it. His doctor thought there was fluid in his pericardium and blistered his precordium with some relief.

He has had a rapid gain in weight since the onset of the anasarca.

On admission the patient was a well nourished young man of twenty-three years. There was puffiness of the eyelids, with slight pitting over the forehead. Superficial veins marked, especially over the upper thorax, and upper right arm, to a less extent in the lower thorax. Relative dulness in second space above, laterally from 4 cm. to the right of the right sternal border, 25 cm. to the left. The dulness at the base was extensive, measuring some 12 cm. transversely. Absolute dulness in the third space above. At the apex both sounds were loud and clear. The liver dulness extended 8 cm. below the costal border in the right nipple line, and the large firm organ could be felt extending across the epigastrium. Penis and scrotum were tremendously œdematous.

Diary. October 21, 1907. Condition unchanged. Dyspnœa. No pain. Fluoroscopic examination showed an extensive mediastinal shadow. The heart was very large, and extended far into the left axilla. At the base the dulness measured 27 cm. transversely. The heart beat was wave-like, as if adhesions were present. The mediastinal shadow at the base was quite wide. No pulsation. The diaphragmatic movements could not be made out.

November 6, 1907. Exploratory puncture made in right chest, posteriorly, and a clear fluid withdrawn. Microscopic examination showed no unusual cells. Increasing anasarca.

November 20, 1907. The larynx was examined by Dr. Birkett, who said that there was thickening of the false vocal cords. General condition was much weaker, but his heart sounds remained strong and regular. General anasarca was increasing.

November 24, 1907. Right chest aspirated; 25 ounces of hemorrhagic fluid withdrawn. Dyspnœa partially relieved.

November 25, 1907. Fluoroscopic examination showed mediastinal dulness to have extended considerably. There was a dense shadow all over the right chest, and on the left side this extended

high up, as far as the second rib, and extended downward and outward into the left axilla, where the heart beat was seen, wave-like in character. Diaphragmatic movements were not visible. The patient died rather suddenly when moving about in a wheel-chair.

Clinical Diagnosis. Mediastinal neoplasm, sarcomatous; blocking of superior vena cava, with bilateral hydrothroax, especially on the right side; pulmonary œdema.

PULSE AND RESPIRATION.

		Pulse		Respiration.				Pulse		Respiration.	
		A.M.	P.M.	A.M.	P.M.			A.M.	P.M.	A.M.	P.M
October	19	76	84	—	24	November	7	76	80	28	36
"	20	76	80	20	20	"	8	82	96	30	30
"	21	72	72	24	22	"	9	76	84	30	30
"	22	72	76	24	24	"	10	76	80	32	26
"	23	76	76	30	28	"	11	78	80	30	28
"	24	72	72	28	32	"	12	80	80	28	42
"	25	80	90	28	28	"	13	92	72	28	26
"	26	78	72	28	24	"	14	78	76	30	31
"	27	76	72	30	24	"	15	76	100	28	44
"	28	80	76	30	28	"	16	76	78	28	36
"	29	80	72	30	28	"	17	76	72	30	28
"	30	72	76	28	26	"	18	84	72	28	28
"	31	84	88	30	28	"	19	84	84	30	28
November	1	82	88	30	30	"	20	72	96	28	36
"	2	84	88	28	30	"	21	80	72	30	28
"	3	88	76	30	20	"	22	80	74	30	36
"	4	80	80	30	26	"	23	80	72	30	36
"	5	88	72	30	24	"	24	72	90	28	31
"	6	78	76	32	28	"	25	62	88	30	36

The patient's condition was closely observed during his stay in the hospital. The extensive venous stagnation which was present in the upper portion of the body indicated a blocking of the superior vena cava, and venous tracings were out of the question. The pulse rate, as is indicated by the table, did not attract attention to organic involvement of the heart, and was in no way indicative of a Stokes-Adams disease. The character of the heart beat as seen with the fluoroscope was wave-like, appearing as if the heart were impeded by adhesions. Arrhythmia of the auricles and ventricles could not be observed at any time.

AUTOPSY. Body that of a young man of large frame, with great œdema and hard brawniness of both arms, chest, abdomen, back, and both legs; scrotum enormously enlarged and hard; penis greatly œdematous; some œdema of face and neck; pupils equal, not contracted; body warm; beginning lividity of right side of chest, and of back; early bedsores on right hip; prominence of right hypochondrium; on section, tissues were very œdematous and bloody; much ascites with turbidity.

Neck. The jugular veins were thrombosed on both sides at the height of the larynx, and extending down from here the carotids and jugulars, just above the clavicle, became enveloped by tumor.

Below the clavicle the tumor formed one large mass behind the sternomastoids and enveloped, laterally, the organs of the neck; the tumor mass was three and one-half inches wide, solid, and of a light pink color; from here it passed into the mediastinum, lying in the middle line until it reached the pericardium, whose upper (visceral) surface was covered as far as the upper three-quarters of the heart. Parietal pericardium over apex was clear; the rest of it involved, circularly. The tumor mass also extended to the right over the parietal pleura, on to the diaphragm, the whole of which, on the right side, was infiltrated, the left being clear. The peritoneal surface of the diaphragm showed the tumor adherent to the liver. The arch of the aorta was surrounded by tumor, the descending thoracic aorta was not involved. This part of the tumor was a continuation of that affecting the parietal pericardium. The larynx was œdematous along the aryepiglottic fold; the trachea was not apparently compressed; although the tumor mass surrounded it at the bifurcation, the angle of the bifurcation was a mass of tumor tissue. Trachea and bronchi were clear. The thyroid was pale, showed colloid, not enlarged.

Thorax. On section of the thorax, the sternum was found adherent to the underlying white mass of fleshy consistence—new growth of mediastinum. The sternum was infiltrated and broke easily. On removal, the mass occupied the right two-thirds of the chest cavity. There were adhesions of the left lung posteriorly, on the upper lobe. The chest contained several hundred cubic centimeters of bloody fluid. There was excess of fluid in the pericardium, about 200 c.c.. The upper part of the heart, anteriorly, was covered by the pericardial growth. The right lung was completely adherent and could not be separated from the diaphragm.

Left Lung. The apex of the lung had tumor tissue growing over it, on the pleural surface, while some tumor tissue infiltrated the substance of the lung beneath. There were some adhesions of new growth over the pericardium where the infiltration of the lung was seen. The lung was gray, crepitated throughout, save for a small patch of hazel-nut size, at the anterior margin of the base; this, on section, appeared red, like an infarct, and was solid. No sign of tuberculosis in the lung. On section, the lung was dry and healthy looking.

Right Lung. Bullæ of œdema between pleural surfaces—cysts of pleura. The lung was solid, meaty, and much clear fluid could be expressed from it. There was no true infiltration of newgrowth in the organ. On section there was œdema.

Heart. This presented a remarkable appearance; the organ was covered by a cap of tumor over the entire right auricle and one-half of the right ventricle. This subpericardial mass also extended over the left auricle and slightly onto the left ventricle. In the left ventricle a solid mass of tumor could be felt within the muscle tissue.

On opening the left ventricle the interventricular septum was found to be a mass of newgrowth, save at its very apex; the septum was much thickened, averaging half an inch. On one side of the right ventricle the columnæ were partly obliterated by the huge plate-like growth of the tumor. The endocardium was everywhere smooth. All the valves appeared to be healthy, and no definite stenoses could be made out. The muscle tissue, apart from the tumor, was very pale. One of the coronary vessels was cut across and was seen to be embedded in tumor, and showed thrombus on its walls. A second cap of sarcomatous tissue was formed by the parietal pericardium, which, in its upper part, was fused into one solid mass of tumor tissue, continuous with the anterior mediastinal tumor. This extended in the form of a cap over the heart. The superior vena cava was firmly surrounded with newgrowth, while its lumen was blocked by a thrombus of some long standing. The main vessels of the neck, arising at the arch of the aorta, were completely surrounded and compressed by the new growth. The trachea and its main bronchi were embedded in a firm mass of white newgrowth. The walls of the pulmonary arteries were, at the hilum of the lung, infiltrated with tumor. The inferior vena cava, as it entered the heart, was surrounded by newgrowths, which extended into the substance of the right auricle and lined its cavity almost completely. The tricuspid valve had some of the newgrowth infiltrating its leaflets from the right auricle. The pulmonary valves were free, although their bases rested upon infiltrated tissue. The same was true of the aortic and mitral cusps.

Aorta. The wall was thin, with a few fatty plaques in the intima posteriorly. The glands about the aorta in the abdomen were œdematous, as was the rest of the tissue. The glands were, otherwise, not enlarged, nor showed tumor.

Abdomen. The peritoneum was clear and shiny. There were some few old adhesions between the gall-bladder and the transverse colon. The peritoneum contained over 750 c.c. of a yellowish and milky-looking fluid.

Œsophagus. Organ was clear throughout. There was no evidence of pressure from tumor in any direction. The tumor mass in the thorax lay anterior to the œsophagus.

Stomach. Contracted and congested throughout. The mucous membrane was clear and velvety. There was no sign of tumor mass in its walls. The duodenum was also congested. Mucosa was bile-stained.

Intestines. There was some congestion and œdema of the intestines, otherwise there was no change. The large intestine had the same characters as the small bowel. The appendix was free. The mesentery of the small intestine was œdematous, and, when cut into, exuded a milky fluid.

Rectum. Clear.

Liver. 1920 grams, 26 x 19 x 8 cm. Organ was of good size; capsule was smooth and tense; organ congested. There was œdema of the gall-bladder, which contained a blood-stained looking bile. The inferior vena cava, as it passed behind the liver, was encircled by tumor mass, which also infiltrated the openings of the hepatic vein. Between the suspensory ligaments the tumor mass lay beneath the capsule of the liver, and infiltrated the liver substance itself. On section, the tumor was found to infiltrate the upper border of the liver, which lay against the diaphragm, for a depth of 4 cm. Liver substance in this area was completely obliterated and looked like bone marrow. Save for this continuous infiltration, the liver contained no other tumor masses. The left lobe of the liver was free. The liver substance itself had a nutmeg character.

Pancreas. 18 cm. long. Organ was pinkish-gray in color; lobules were distinct; the organ was healthy looking.

Spleen. 185 grams, 12 x 4 x 3 cm. Organ was dark in color, very firm, and of cardiac nature; otherwise it showed no changes. The mesenteric glands were slightly enlarged and œdematous.

Adrenals. The left adrenal was healthy; organ was rather dark in color, but showed no change in substance. The right adrenal lay close under the diaphragm of the right side, and there was a continuous infiltration of tumor mass from the infiltrated diaphragm over the peritoneal surface of the adrenal and kidney. The right adrenal showed a small nodule, 1 x 1.5 cm., with tumorous substance within it.

Left Kidney. 200 grams; organ was firm and œdematous, 12 x 3.75 x 5 cm. Capsule was thin and peeled readily. Organ was indurated. The cortex was swollen. A slight amount of tissue was removed with the capsule, near the hilum. The pelvis and ureter were free.

Right Kidney. 230 grams, 12.5 x 3.7 x 5 x 4 cm. Organ showed a tumor mass beneath the capsule, 6 mm. in diameter. The kidney substance was infiltrated as far as the pyramids and about the pelvis. The tumor mass was light in color and, on the surface, displaced kidney tissue entirely. Ureter was free. The spermatic vein was thrombosed. The inferior vena cava opposite the renal vein showed a large and firm thrombus, firmly adherent, measuring about 4 cm. in length. Its lumen, however, was not entirely obliterated.

Bladder. Several veins about the bladder in front, and also the prostatic plexus, were thrombosed. The bladder mucosa was reddened and slightly œdematous, but otherwise healthy.

Prostate. Normal. Testes were clear.

Bones. Sternum: Opposite the tumor mass of the right thorax the sternum was infiltrated in its bony and cartilaginous tissues, as well as the intercostal muscle, by newgrowth. The bone was much softened, and, in parts, appeared carious. The plaque of infiltration of newgrowth against the sternum was 11 cm. in diameter,

from above downward, and lay mostly to the right side. Opposite the clavicles the tumor lay on the first rib and was adherent to it on the left side. The right side was free. The vertebræ did not appear infiltrated.

Microscopic Examination. Aorta. The aortic wall, including intima and media, was clear, save for the faintest fatty degeneration of some of the muscle cells. Immediately beyond the media, that is, in the adventitia, the aorta was nothing but tumor, with some blood-vessels within it, The tumor cells were mainly of the small round-cell character, with a few spindly-looking cells and nuclei mixed in it. It was remarkable that no tumor infiltration was to be found in the media of the aorta, although the tumor cells came directly up to this tissue. The tumor cells were the size and shape of lymphocytes, with relatively large and dark-staining nuclei, with but little protoplasm surrounding them. The cells were massed together, with little stroma between them, nor was there any capsule or membrane limiting the tumor mass. The tumor cells advanced at the periphery by infiltration.

Heart. The heart muscle, where such was present, appeared healthy, save that in places it had suffered from compression. The pericardial surface showed a layer of fibrous tissue on the outside, with an infiltration of tumor cells beneath it. The epicardial fat was infiltrated with tumor tissue. All through the heart muscle, and lying between the bundles of muscle cells, was tumor tissue of the character of a small round-cell sarcoma. The normal fibrous tissue of the heart was still to be made out. In one area tumor cells were to be found within a bloodvessel. The infiltration of tumor was frequently in large heavy strands.

A transverse section was taken of the ventricular septum on the right side just below the insertion of the tricuspid valve. The section extended across the entire septum through the regions occupied by the bundle of His, and extended half way through the thickness of the septum, which, at this part, varied up to 2 cm. in diameter. Macroscopically, the septum, at this point, showed only a few heart muscle fibers at the extreme ends (right and left) of the septum. In the sections made it was found that sarcomatous tissue had almost entirely displaced the heart muscle, and only here and there were some bundles of fibers, whose individual elements were permeated with newgrowth. In none of the sections could the bundles of His be distinguished, or any trace of them found.

The entire interventricular septum was obtained, special precautions being taken to preserve the septum fibrosum and the surrounding tissue. The septum was then divided into blocks suitable for section, and serial sections were made from before backward. In this way the entire thickness of the septum was obtained, and the entire area covered by the bundle of His was examined.

Although the course of the auriculo-ventricular bundle has been

fairly well defined, and the situation of the two limbs in the two ventricles of the normal heart is known, yet considerable difficulty is experienced in definitely locating the position of the muscle bundles in a specimen so completely disorganized by newgrowth as the one under observation.

As above stated, the greater portion of the interventricular septum is infiltrated with newgrowth to within a short distance of the apex. The infiltration of the new growth into the septum has thickened it and increased its bulk to a considerable extent. The infiltration is greatest at the upper portion of the septum, and occupies its tissue from its anterior to its posterior margins. The endocardial surface appears quite smooth, and the endocardium seems to be retained over it. On cutting into the septum, one cannot distinguish the presence of muscle tissue with the naked eye. The white and infiltrated appearance of the septum is the same from both ventricles.

The sections of the septum show the muscle tissue almost entirely replaced by tumor cells. These latter cells are of the small round variety, having in the most part a round, darkly-staining nucleus, with very little protoplasm surrounding it. The cells take no definite arrangement among themselves or at the stroma. The stroma is very sparse and appears to be that which normally exists in the heart muscle. The tumor advances at its borders by infiltrating the connective tissue between the muscle fibers and by their mass, obliterating the muscle cells of the part. The infiltration of the tumor beneath the endocardium appears more rapid than in the muscle tissue. The most advanced infiltration is found immediately beneath the endocardium and its connective tissue layer. The degree of infiltration of the musculature varies in different parts, but in general the greatest infiltration and obliteration of muscle tissue is found in the uppermost part of the septum.

The usually thin and tendinous septum fibrosum is half an inch in thickness, being occupied over its right surface by a thick tumor mass. This extends downward on the right side beneath the endocardium.

Along the anterior and lower margin of the septum fibrosum, where connective tissue strands pass in a V-shaped figure into both ventricles, there is considerable tumor infiltration, but there remains, however, a certain number of muscle fibers at the point of the fibrous division. These fibers prove to be the remains of the heart muscle and distinctly show transverse striations of their substance. Directly beneath the endocardium of the left ventricle tumor cells occupy almost the entire tissue, leaving only here and there occasional strands of connective and elastic tissne, while among these an occasional cell, looking like a muscle fiber, is encountered. These apparent muscle fibers are considerably distorted by the pressure of the tumor cells. Close examination does not reveal any cross striations. Their position is usually among what are connective tissue

strands beneath the endocardium, and occasionally elastic fibers are demonstrated in their neighborhood. Although serial sections were obtained of this area, these fibers cannot be followed as a bundle for any distance, as these elements exist only as scattered cells, having, histologically, no close association with other fibers like them.

In the sections made anterior to the septum fibrosum, no elements of this nature were apparent.

Again, in sections made transversely through the septum at various levels, definite muscle elements, occupying the position of the bundle of His, could not be made out more clearly than the fibers already described. Everywhere these fibers appeared atrophied, and had lost their usual plumpness. At times even the fresher of the surrounding tumor cells compress the individual fibers. No muscle elements having even a suspicion of the His' bundle are evident in the right ventricle.

Lung. The alveoli were still well marked out, but were filled with a clear exudate and red blood cells. There was no leukocytic infiltration.

Spleen. Fairly congested, and lymphoid tissue was rather diffuse. There was no evidence of tumor infiltration.

Adrenal. Section consisted almost entirely of tumor tissue, with strands of adrenal cortex scattered through it. The staining differentiated very well the tumor from the adrenal. The tumor cells varied in their appearance from large protoplasmic cells to small, almost lymphoid, tissue; the medulla of adrenal did not appear infiltrated.

Kidney. The greater portion of the section was infiltrated with tumor mass. In infiltrated areas nothing remained of the tubules or of the original kidney substance, save the bloodvessels and glomeruli. The tumor mass was made up of irregular small cells, distributed in strands and small masses. There was a considerable stroma between the individual cells and masses of cells. In many cases the tumor cells were definitely spindle-shaped.

Liver. Very little was left of liver tissue in the section. Its entire area was occupied by tumor of a sarcomatous nature. Some of the original fibrous tissue bands were still present. Within the remaining liver tissue stagnated bile pigment was found. There was considerable stroma to be found in the tumor tissue.

To sum up, the anatomical findings which interest us most are the extensive sarcomatous infiltrations of the heart, its pericardium, and its large veins. In substance the heart is occupied by sarcomatous tissue in two-thirds of its mass. The sarcomatous invasion has replaced the heart muscle to a great extent, not only in its outer walls, but also in the auricular and ventricular septa. Histological examination of the septum demonstrates a disorganization of the bundle of His. Although we cannot definitely say that the bundle of His has been completely obliterated, yet truly recognizable

Purkinje fibers were not found. If we allow, however, that the distorted muscle-like elements appearing beneath and among the connective tissue fibers of the septal endocardium are elements of the bundle of His, we still find that these elements have been greatly reduced in number, and those that are present have been compressed and distorted by the sarcomatous infiltration. It is not at all clear to us that all these subendothelial fibers are of the Purkinje type. In fact, we must admit that some are, most probably, elements belonging to the longitudinally disposed heart muscle fibers, which appear superficial to the situation of His's bundle.

In view of the extensive disorganization of the bundle of His, it is difficult to correlate the clinical findings with the generally accepted views concerning this bundle. If the bundle of His is alone responsible for the maintenance of the proper rhythmic contraction of the ventricle, then we must assume that an extremely small number of these fibers can carry on that function for the proper maintenance of life. In the case described, the few Purkinje fibers which remained (if such they were), were very much altered by sarcomatous invasion and pressure. The function of these few cells must have been considerably diminished, and could only have supplied impulses to a small portion of the ventricle.

It is more than likely that the heart is dependent not alone upon the bundle of His for the transmission of impulses and the proper correlation between the auricle and ventricle, but that other factors, such as the cardiac muscle, central nerve fibers, and cardiac ganglia with their nerve plexuses, each and all may assume a portion of the work of maintaining a proper control and relationship of auricle and ventricle.

THE ASSOCIATION OF "RHEUMATIC FEVER" AND THE ERYTHEMA GROUP OF SKIN DISEASES.

WITH A REPORT OF FOUR CASES.

By Oscar M. Schloss, M.D.,
of New York.

Under the erythemas, in addition to simple erythema, erythema nodosum, erythema multiforme and exudativum, Osler[1] includes urticaria, purpura, and angioneurotic œdema. This classification is used by recent writers, though it is, perhaps, open to the criticism that the term erythema is not descriptive of, at least, two diseases included in this group—urticaria and angioneurotic œdema. In the absence of a more comprehensive title, the above classification will be used in this report.

[1] Amer. Jour. Med. Sci., 1904, cxxvii, 1; Brit. Jour. Dermat., 1900, xii.

Most writers consider that there is some relationship between rheumatic fever and some of the members of the erythema group of skin diseases—simple erythema, erythema exudativum, erythema nodosum, and purpura—and that these diseases may be rheumatic complications. Recently, doubt has been expressed in reference to this association, and it is the object of this paper to report four cases which seem to have some bearing on the question.

It has long been known that the members of this group of skin diseases are in some way related. They are frequently seen in association with the same diseases, often at the same time, and frequently replace one another. Osler has called special attention to the similarity of the various members of this group and to their visceral manifestations. To quote this writer: "The essential process is a vascular change with exudate, blood, serum, alone or combined. While five or six of the affections just named [Osler refers to simple erythema, erythema exudativum, herpes iris, erythema nodosum, certain of the purpuras, and angioneurotic œdema] are described usually as separate diseases, they belong to one family, and are characterized by the similarity of the conditions under which they occur, the frequency with which the lesions are substituted the one for the other at different times, the tendency to recurrence, often through a long period of years, and, lastly the identity of their visceral manifestations." In discussing the etiology of his cases Osler suggests that the rheumatic poison is probably responsible for many.

Cheadle[2] includes erythema exudativum and purpura rheumatica in the rheumatic series, and Poynton[3] mentions the fact that purpura and erythema exudativum may be associated with rheumatic fever. Church[4] found erythema nodosum as a complication in 10, and purpura in 16, out of 1431 cases of rheumatic fever. The frequency with which erythema nodosum bears the stamp of a primary disease has led Symes,[5] among others, to doubt its association with rheumatic fever. It is believed by these writers that the arthritic symptoms which often accompany this primary form of erythema nodosum have led in many cases to the unwarranted diagnosis of rheumatic fever.

On similar grounds there is diversity of opinion in reference to purpura. Mackenzie[6] found 61 out of 200 cases of purpura to be associated with rheumatism, while Pratt[7] believes that this association is uncommon. The latter suggests that most cases in which purpura is described as a rheumatic complication merely

[2] System of Medicine, Allbutt and Rolleston, ii, Part 1, p. 645.
[3] Modern Medicine, Osler and McCrae, ii, p. 676.
[4] System of Medicine, Allbutt and Rolleston, ii, Part 1, 594.
[5] Lancet, January 26, 1907. [6] System of Medicine, Allbutt and Rolleston, v, p. 845.
[7] Modern Medicine, Osler and McCrae, v, p. 681.

represent forms of arthritic purpura and are different in nature and origin from true rheumatic disease.

It seems that these milder forms of symptomatic arthritis which occur in connection with erythema nodosum and purpura are responsible for this confusion. In the present state of our knowledge the basis for the diagnosis of rheumatic fever is entirely clinical, and it is merely on clinical grounds that it is differentiated from other diseases of which arthritis is one of the symptoms. It may be true, in some instances, that the occurrence of arthritic symptoms with these skin diseases has led to the hasty diagnosis of rheumatic fever, and that in these cases the skin lesion, an essential part of the disease, was considered a complication.

Whether the distinction of rheumatic fever from the forms of purpura and erythema nodosum presenting mild arthritic manifestations is justifiable, or whether they are closely related, is entirely a question of etiology. The answer can only be given when we know the agencies on which these diseases depend; and until established this confusion must, to some extent, continue. From a purely clinical standpoint, however, the distinction seems fairly clear, for these forms of symptomatic arthritis are usually mild and do not give rise to the clinical signs, the course, or the complications of true rheumatic disease. Yet it must be admitted that some cases of proved rheumatic disease present slight arthritic manifestations, but these cases occur most frequently in children, and the complications disclose the real nature of the affection.

Angioneurotic œdema is rarely mentioned as a complication of rheumatic fever, though its association with the other members of the erythema group is unquestionable. When it occurs as a primary affection the clinical picture is not that of an infectious disease, as is frequently the case with the primary forms of purpura, erythema nodosum, and exudative erythema. Acute general symptoms are usually lacking, and the attacks which occur over long periods of time are separated often by intervals of months or years.

Urticaria not infrequently accompanies rheumatic fever, but its relationship to this disease is not clear. Urticaria may be associated with so many conditions that its occurrence with rheumatic fever may be purely coincidental. The frequent occurrence of urticaria with the other members of the erythema group whose association with rheumatic fever is better established would seem to indicate more than mere coincidence.

The members of the group of skin diseases under discussion occur under many different conditions, and it is both unnecessary and beyond the scope of this paper to attempt their description.

In the following cases members of the erythema group of skin diseases occurred in rheumatic subjects or in association with rheumatic fever.

CASE I.—*Rheumatic fever; purpura; urticaria; angioneurotic œdema; erythema simplex. Recovery.*

The patient, a man, aged thirty-five years, a teamster by occupation, was admitted to the hospital May 7, 1906. Both parents are living and well. There is no history of rheumatic fever in the family. The patient had measles and diphtheria when a young child and chorea at the age of ten years. He has been subject to tonsillitis for many years.

The first attack of acute articular rheumatism occurred seven years ago. The patient was ill for six weeks and recovered completely. He had a second and third attack of this disease four and two years ago, respectively, and during the latter attack "large purple blotches" appeared on the legs and abdomen. Three years ago he had bilateral suppurative otitis media, and for five months there was a discharge from both ears. The discharge has reappeared twice since the primary attack. Five years ago the patient had gonorrhœa, which lasted six months. He has been a heavy drinker, smokes moderately (?), and works very hard when sober. For four weeks preceding the onset of the illness the patient had been drinking heavily, but was apparently in good health. Four days before admission to the hospital he became ill. At this time the left wrist was swollen and very painful. The next day a rash appeared on both lower extremities and the patient became delirious.

The following are the notes of the examination on admission: The patient is not aware that he is in the hospital, and does not respond to questions in an intelligent manner. He is well nourished and muscular, the face is flushed, both pupils react to light and accommodation, and there is a slight purulent discharge from both ears. The tongue is heavily coated in the centre, but the edges are clean. Both tonsils are large and almost meet in the median line, but show no signs of acute inflammation. There are a few medium moist rales at the extreme base of each lung, and with this exception the examination of the lungs is negative. The point of maximum cardiac impulse is in the sixth interspace in the mid-clavicular line. The right border of relative cardiac dulness cannot be outlined. On the left side the relative cardiac dulness extends 6 cm. from the left sternal border in the third interspace. At the apex the first sound seems normal, the second indistinct. At the base both sounds are indistinct, though the aortic second is louder than the pulmonic second. The radial pulse is of moderate volume, is well sustained and the arterial wall is moderately thickened. The systolic blood pressure is 120 mm. Hg. (Riva Rocci instrument, wide cuff). The abdomen is not distended and the respiratory movements are well seen. Neither the liver nor the spleen can be felt and there are no palpable masses. The areas of splenic and liver dulness are normal. There is a hemor-

rhagic eruption over the arms, legs, and trunk. The eruption consists of two elements, large purpuric spots 1 to 3 cm. in diameter and fine petechiæ. Both forms are in distinct crops, some have almost faded and are yellowish, others have a purplish color, and the remainder are scarlet. On pressure a few of the petechiæ become colorless, but the greater part of the rash is unchanged. There is an erythematous area over the posterior portion of the left leg, and extends from just above the ankle-joint to the middle of the calf. This area shows no induration and no increase of local temperature. The left wrist is swollen and the slightest motion is very painful. The overlying skin is tense, hot, and pits on pressure. There is slight swelling over the dorsum of the hand. The patient is actively delirious; he thinks that he is driving horses and does not recognize the members of his family. The hands show a coarse tremor. The tendon reflexes are slightly exaggerated in both extremities. Kernig's sign is not present, there is no ankle clonus, and the planter response is normal.

On May 8, the sixth day of the illness, the left knee was greatly swollen, tender, and hot. The patient was delirious and very restless. The urine had a specific gravity of 1028, was clear, amber colored, and contained a slight trace of albumin. The microscopic examination was negative. The blood contained 23,000 white cells per c.mm., and a differential count gave the following results: Polymorphonuclear cells, 83 per cent.; lymphocytes, 11 per cent.; large mononuclear cells, 3 per cent.; eosinophiles, 0.2 per cent.; and cells with basophilic granules, 0.6 per cent. Four hundred cells were counted.

May 9. The right ankle-joint is swollen and inflammed. The hemorrhagic rash is less distinct and there are no new elements. The erythematous area on the left leg has almost disappeared. The patient is weaker, and takes little nourishment.

May 10. Over the right side of the head there is a large subcutaneous swelling which extends horizontally from the posterior median line to the auricle and vertically from the sagittal suture to the tip of the mastoid process. The swelling is circumscribed, covers an area about 9 cm. in diameter, and is greatest over the mastoid process. The local temperature is not increased, the skin is not reddened, and pressure over the mastoid process elicits no sign of pain. The swelling pits deeply on pressure. The patient is seen by Dr. W. S. Shattuck, who thinks that there is no mastoid involvement. The erythematous area has disappeared from the left leg, but there is a fine desquamation of the skin over this area. The hemorrhagic rash is much fainter. The patient has profuse sweats.

May 11. The swelling described in the last note has almost disappeared. The urine contains a slight trace of albumin. There is no change in the patient's general condition.

May 13. There have been several crops of urticarial wheals over the abdomen, back, and lower extremities, and there is well-marked "dermatographia." The left ankle-joint is inflamed; the swelling of the other joints has greatly diminished and motion is much less painful. The patient is irrational at times, but he has lucid moments, at which times he is able to recognize his surroundings. He still perspires freely. The swelling which was in the mastoid region has disappeared and no trace of it remains.

May 15. The patient is much better today; his mind is perfectly clear and he is able to recognize the members of his family. The urticaria has not recurred and the arthritis is rapidly subsiding. The joints which were first involved are entirely well.

May 16. The improvement continues. The left knee- and ankle-joints are still slightly inflamed, but the signs of inflammation have diminished. The site of the hemorrhagic rash is marked only by a few yellowish spots. The examination of the urine is negative. From this time the improvement was rapid. On May 21 the arthritis had entirely subsided, and two days later the patient was allowed to get out of bed. A complete physical examination at this time showed nothing of importance.

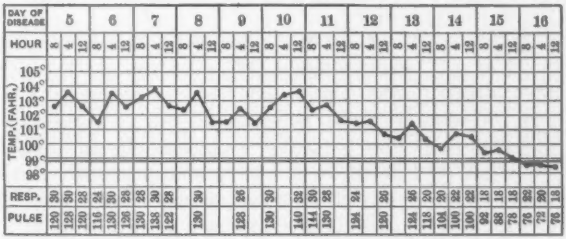

FIG. 1.—Temperature chart of Case I.

Sodium salicylate and sodium bicarbonate were given in 20-grain doses every three hours during the febrile period (Fig. 1). At the time of the angioneurotic œdema, 20 grains of calcium lactate was given every four hours. Clinically, this case was clearly one of rheumatic fever. The history of chorea and of previous attacks of rheumatic fever, as well as the nature of the arthritis in the present attack and its improvement under the administration of sodium salicylate, give sufficient evidence.

The area of angioneurotic œdema over the mastoid process in the presence of chronic otitis media suggested, at first, that the swelling was due to mastoiditis. The absence of signs of inflammation, the findings on examination of the ear, and the rapid subsidence of the swelling were sufficient to exclude this diagnosis.

CASE II.—*Rheumatic fever; erythema nodosum; purpura; urticaria; erythema exudativum; intestinal hemorrhage; pericarditis. Death on the twenty-first day of the disease.*

The patient, a man, aged thirty-five years, was admitted to hospital on December 28, 1906, and gave the following history: No member of the family has suffered from rheumatic fever or skin eruptions. The patient contracted syphilis six years ago, and was treated for three years. Four years ago he was ill four weeks with acute articular rheumatism, and recovered completely from this disease. During the illness there were a few reddish nodules on both legs, which the patient thinks were similar to those now present. Three years ago he was ill with typhoid fever for six weeks. He has been a heavy drinker for twelve years and smokes ten to twenty cigars a day. Previous to the present illness the patient was in good health. The onset of the disease was sudden four days before admission to hospital. The initial symptoms were headache, general pains in the muscles, fever, and cough. The next day the right ankle became swollen and painful. On the third day of the illness there was a small intestinal hemorrhage, and a rash appeared on both legs. On the basis of a typhoid agglutination reaction the disease was diagnosticated typhoid fever and the patient sent to the hospital.

Note on the day of admission to the hospital, the fifth day of the disease. The patient complains of weakness and cough. He is a large, rather fleshy man. The face is flushed, he is semi-stuporous, but can be easily roused, and answers questions in a rational manner. There is profuse sweating over the whole body. Examination of the nose, ears, and pharynx reveals nothing of importance. The posterior cervical, submaxillary, and inguinal lymphatic glands are palpable, but are not greatly enlarged. Over the base of each lung are a few sonorous and sibilant rales; with this exception the examination of the lungs is negative. The point of maximum cardiac impulse is in the fifth interspace 2 cm. within the midclavicular line. The right border of cardiac dulness corresponds to the right sternal border. In the third left interspace the relative cardiac dulness extends 5.5 cm. from the left sternal border. The heart action is rapid and sounds are clear at both apex and base. At the base of the heart the second aortic sound in accentuated. The radial pulse is small, well sustained, and the arterial wall is moderately thickened. The systolic blood pressure is 118 mm. Hg. (Riva Rocci instrument). The abdomen is symmetrical, soft, and there is no evidence of pain on palpation. On deep inspiration the edge of the liver can be felt below the costal margin; the upper border of liver dulness begins at the level of the fourth right interspace. The area of splenic dulness is increased, but the edge of the spleen cannot be felt on abdominal examination. Over each lower extremity there

are 15 to 20 indurated purplish nodules, which vary from 0.5 to 1 cm. in diameter. They involve the entire depth of the skin and become colorless on pressure. These nodules are distributed over both lower extremities from the ankle to the hip, but they are thickest in the region of the knee- and ankle-joints, and there are two on the lower part of the abdomen. There are several large purpuric spots on the back and right leg. The right ankle-joint is swollen and the slightest motion is very painful. The skin is tense, shiny, and hot. There is slight subcutaneous œdema of the right foot.

On admission the temperature was 103° F., the pulse 120, and the respirations 36. In dilutions of 1 to 20 the patient's blood serum agglutinated typhoid bacilli in one and one-half hours, but in dilutions of 1 to 50 agglutination was absent at the end of three hours. The white blood cells were 26,000 per c.mm. and were present in the following proportion: Polymorphonuclear cells, 82 per cent.; lymphocytes, 12 per cent.; large mononuclear cells,

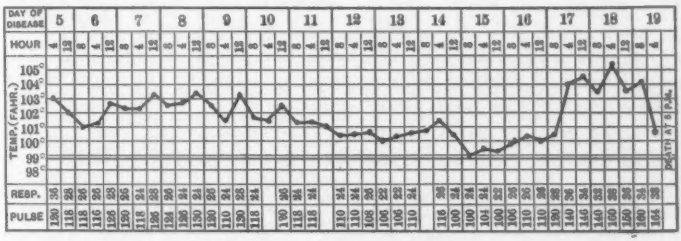

FIG. 2.—Temperature chart of Case II.

3 per cent.; eosinophiles, 0.2 per cent.; and cells with basophilic granules, 0.1 per cent. Four hundred cells were counted. The urine was clear, high colored, and contained a faint trace of albumin. The specific gravity was 1022 and the microscopic examination was negative; 8 c.c. of blood was taken from the median vein and glucose agar, broth, and blood serum inoculated. The media was incubated at 37° C., but no bacterial growth occurred.

For three days there was no important change in the patient's condition. The temperature was almost constantly in the vicinity of 103° (Fig. 2), but there were slight morning remissions. During this time the rash began to fade, the edges of the nodules became yellowish, and the induration less marked. On the fourth day in the hospital the left elbow was swollen and showed all of the signs of acute inflammation. On the following day the left ankle showed similar signs, and two days later the right knee became involved. During this period the temperature ranged from 101° to 103° F. and the rash faded considerably. A few dry rales were

present in the posterior portion of each lung, but there was little cough. During this time the patient became much weaker.

For three days the patient showed signs of improvement; he was brighter, took more nourishment, and the temperature ran a lower course. The inflammation of the right ankle-joint almost disappeared and the swelling was less in the left ankle- and elbow-joints. The right knee was still greatly inflamed.

On January 7, the eleventh day in the hospital, a rash was noted on the front of the chest and on the buttocks. This rash consisted of many papules 2 to 5 mm. in diameter, pinkish in color, and raised above the surrounding skin. The papules were very thick on the chest and coalesced in places to form several large plaques 2 to 4 cm. in diameter.

On January 9 the following note was made: The papules have increased in size, but no new ones have appeared. The plaques are very distinct and the edges are gyrate. These areas show three grades of coloring; the centre is grayish, outside of this is a yellowish zone, and the external border is reddish purple. The patient has been actively delirious for twenty-four hours, he takes very little nourishment, and is quite weak. There are a few urticarial wheals on the back and lower extremities. The right border of cardiac dulness extends 3 cm. to the right of the right sternal border in the third interspace. In the third left interspace the relative cardiac dulness extends 6.5 cm. from the left sternal border. The apex impulse cannot be seen. There is a continuous thrill palpable over the precordial area, and corresponding to this thrill a to-and-fro friction rub can be heard, which is loudest over the base of the heart. The sound is rough, it seems close to the ear, is intensified by pressure, and obscures the heart sounds. The right ankle-joint appears normal, the left ankle and elbow are but slightly swollen, and the right knee shows signs of improvement, but is still inflamed. From this time the patient gradually became weaker, and death ensued on January 11, the nineteenth day of the illness. At the time of death the skin lesions had almost faded and the inflamed joints were in practically the same condition as at the time of the preceding note.

A postmortem examination was made on January 12 by Dr. Joseph. The examination of the lungs showed only congestion of the larger bronchi. The pericardial sac contained about 5 c.c. of a straw-colored fluid which contained a few flocculi of fibrin. The visceral and parietal surfaces of the pericardium were covered by a fibrinous exudate, and on its removal the surface of the membrane showed intense congestion. The myocardium showed fatty and parenchymatous degeneration. The mucous membrane of the small intestine was congested throughout the entire length, but there were no ulcers or changes in the lymphoid tissue. The origin of the hemorrhage could not be determined, and the large

intestine seemed normal. Permission was only obtained for a partial examination, and for this reason the remainder of the organs were not disturbed. Histological examination of the organs removed confirmed the anatomical diagnosis and revealed nothing of further importance.

The previous history of this patient, the nature of the arthritis, and its improvement under administration of salicylates seem to indicate the rheumatic origin of the disease. Of especial interest was the original diagnosis of typhoid fever, which was based on the agglutination reaction. The agglutination was present only in low dilution, and was presumably due to the previous attack of typhoid fever.

CASE III.—*Follicular tonsillitis; erythema multiforme; urticaria; colic. Recovery.*

The patient, a female, aged nineteen years, was admitted to the hospital on October 19 for chancroids. There was no family history of rheumatic fever or skin eruptions. The patient has had an attack of acute tonsillitis almost every winter since childhood. Two years ago, following an attack of tonsillitis, both knees and ankles were swollen and a skin rash was present. From the patient's description the rash was probably purpuric. She was in bed for five weeks, and the disease was followed by complete recovery. Her general health has always been good.

On November 3 she complained of sore throat, headache, and pains in the back and limbs. The tonsils were red and swollen and the crypts filled with a fibrinous exudate. The examination of the heart, lungs, and abdominal organs revealed nothing of importance. The temperature was 102.5° F., the pulse 118, and the respirations 24. The following day the morning temperature was 101° and the evening temperature 102°. A culture from the tonsils, made on November 3, showed colonies of an organism whose morphology and staining reactions corresponded to the streptococcus. After the usual treatment the temperature fell and the general symptoms disappeared. On November 6 the temperature was lower, but was still above normal; the morning temperature was 99° F., the evening temperature 101°. On this day there was a scattered erythematous rash on the abdomen, back, chest, and neck. The elements were discrete pinkish papules, 2 to 4 mm. in diameter, which were slightly indurated. The rash was symmetrical in distribution, became colorless on pressure, and on each side of the chest one of the papules was capped by a vesicle. The urine was negative. A blood count showed 15,000 white cells in the following percentages: Polymorphonuclear cells, 78 per cent.; lymphocytes, 16 per cent.; large mononuclears, 3 per cent.; eosinophiles, 2 per cent.; and cells with basophilic granules, 0.8 per cent. Four hundred cells were counted.

On November 7 the temperature was still slightly elevated, but

the patient felt comfortable. There were a few urticarial wheals on the back and the erythematous rash was unchanged. The tonsils were no longer congested, but were still slightly swollen. The following day the throat appeared normal, the patient complained of no discomfort, and there was no fever. There was a new crop of papules on the abdomen, chest, and back similar to those first described. About 11 P.M. the patient was seized with acute abdominal pain. The pain was general, cramp-like, came in paroxysms, and was most intense in the epigastrium. The bowel movements had been normal, and there was no vomiting during this attack. The pain was so severe that morphine was required, which rendered the patient more comfortable and she was able to sleep at intervals. Early the next morning the pain resumed its original severity and was accompanied by several vomiting spells. The abdomen was not distended, was soft, without muscle spasm or palpable masses. The morning temperature was 99° F. Toward noon the acute pain subsided, but a slight sensation of soreness remained. For the first time the patient complained of a burning sensation from the rash and the redness and induration of the papules were more noticeable. The evening temperature was 101°, the pulse 100, and the respirations 20.

On November 10 the temperature was normal and many of the papules were covered with vesicles containing a clear fluid. The rash showed signs of fading on the next day, and some of the vesicles were less distended. The temperature was normal and the patient felt comfortable.

On November 12 a systolic murmur was audible over the entire precordium, but of greatest intensity at the pulmonic area. There was no increase of the relative cardiac dulness and the murmur was not transmitted to the axilla or back. The temperature was normal; the radial pulse was regular, 78 to the minute, and of good volume and tension. The arterial wall was not thickened.

By November 20 all signs of the rash had disappeared and the patient seemed entirely well. At this time the cardiac murmur was faint and was present only at the pulmonic area.

It may be urged that the rheumatic nature of this case is questionable, since arthritis was not present during the illness. The history of arthritis, which corresponded to rheumatic fever, a purpuric rash at this time, and tonsillitis at the onset of the recorded illness are points which seem at least suggestive. The attack of abdominal pain was probably of the same origin as that seen in Henoch's purpura and in connection with angioneurotic œdema. The heart murmur was probably of functional origin.

CASE IV.—*Tonsillitis; urticaria; erythema nodosum; period of improvement with the occurrence of angioneurotic œdema; sudden onset of pericarditis. Death.*

The patient, a female, aged twenty-two years, was admitted

to the hospital suffering from gonorrhœal vaginitis, but at the time of the present illness there was no evidence of this disease. There had been no perceptible discharge for more than two weeks, and four vaginal and urethral smears made on alternate days were negative. There was no family history of rheumatic fever. The patient had measles and mumps when a young child. She has had three severe attacks of tonsillitis, and following this disease, two years ago, the left ankle, right knee, and both elbows became swollen. The joints were involved in succession; they were greatly swollen and motion was very painful. The recovery from this attack was complete in two months. Two months before the present illness the patient was treated in the hospital for rheumatic fever. Both wrists, the right knee, and the left ankle were affected. The acute arthritis lasted only two weeks, and the patient was discharged on the twenty-first day of the disease. There was no skin eruption during this attack. The onset of the present illness was sudden. The patient complained of headache, general pains in the back and limbs, and sore throat. The tonsils were red and greatly swollen, but there was no exudate. The general symptoms were severe. The temperature was 103° F., the pulse 130, and the respirations 28. Examination of the thoracic and abdominal organs was negative. On the second day the temperature fell to 100.5° and the patient was more comfortable. There were a few urticarial wheals on the abdomen. The congestion of the tonsils was less, but swallowing was quite painful. On the third day of the disease there were 10 to 15 reddish nodules on each leg below the knee. They were hard, about 1 cm. in diameter, and the color disappeared on pressure. The temperature in the morning was 98° F., in the evening, 99°. At this time the signs of acute inflammation of the tonsils had almost disappeared. For a time there were no further developments; the patient slowly improved, and in seven days from the onset of the illness was out of bed, weak, but free from other symptoms. For the first two days after their appearance the papules increased in size and seemed to involve the entire thickness of the skin. They later became purplish, and then began to fade. Beyond slight anemia, there were no abnormal physical signs at this time. The red blood cells were 4,100,000, the hemoglobin was 50 per cent., and the white cells were 8000.

On November 12, fourteen days from the onset of the tonsillitis, there was a large subcutaneous swelling over the left eye. The swelling was circumscribed, it pitted on pressure, was about 4 cm. in diameter, and was raised about 2 cm. above the surface of the surrounding skin. The temperature was 99°, the pulse 122, and the respirations 20. The urine was pale, the specific gravity was 1022, and no abnormal constituents were found. The swelling over the eye began to decrease in size about six hours after its

appearance, and in twenty-four hours had entirely disappeared. There were no other symptoms at this time.

On December 1 the patient became very ill. The temperature, which had been running a normal course, rose to 104°; the pulse was 140, and the respirations were labored and 32 to the minute. The patient had been slowly improving and was out of bed at this time. The following note was made: The respirations are labored, the facial expression anxious, and the skin is slightly cyanotic. The examination of the thoracic and abdominal organs, with the exception of the heart, is negative. The point of maximum cardiac impulse is in the fifth interspace, 3 cm. within the midclavicular line. There is a distinct to-and-fro thrill over the entire precordium, and corresponding to this thrill a friction rub can be heard. The rub is loud, it masks the heart sounds, is increased by pressure, and is of greatest intensity over the base of the heart. The pulse is small, of low tension, and is irregular in both force and rhythm. Percussion over the heart is extremely painful, and for this reason no attempt is made to outline the cardiac dulness.

The patient did not improve, but lost consciousness and gradually became weaker. Death ensued thirty-six hours after the onset of the pericarditis. The request for a postmortem examination was refused.

This patient had two attacks of acute articular rheumatism. The latter attack occurred under observation, and though it was mild, it seemed a clear case of rheumatic fever. Arthritis was not a part of the recorded illness, but the onset with tonsillitis, and pericarditis as a complication, taken in connection with the previous history, suggest the probability of its rheumatic nature. Since the patient acquired gonorrhœa between the last attack of rheumatic fever and the fatal illness, the possibility of a gonorrhœal septicemia has to be borne in mind. The evidence, however, is in favor of the rheumatic nature of this case, for there were no signs of pelvic inflammation and the patient had apparently recovered from the vaginitis.

It may be urged that at least two of the cases—the fatal Cases II and IV—should be placed in the category of septic infections, since rheumatic fever in adults is not frequently a fatal disease. It is well known that forms of arthritis occur with certain infectious diseases which may closely resemble the arthritis of rheumatic fever, and that some of the members of the erythema group of skin diseases may occur under similar conditions. In spite of this similarity the fatal outcome in the two cases referred to was due to pericarditis, which is one of the recognized clinical complications of rheumatic fever. Moreover, in the absence of a positive diagnostic test we are forced to adhere to the accepted clinical conception of rheumatic

fever, and the diagnosis can be based only on the presence of the clinical features of the disease.

In Cases I and II the evidence in favor of the rheumatic nature of the disease is rather strong. The previous history, as well as the clinical characteristics of the observed illness, all point in this direction. In Cases III and IV the evidence is based almost entirely on the history. In Case III an attack of arthritis, which corresponded closely to rheumatic fever and which was accompanied by a purpuric rash, is of importance. In the fourth case a definite attack of rheumatic fever occurred under observation a short time before the recorded illness. The onset with tonsillitis in both of these cases is also suggestive.

To repeat, in two of the four cases—I and II—members of the erythema group were associated with arthritis clinically indistinguishable from the arthritis of rheumatic fever; in the remaining cases arthritis was not a part of the disease, but the previous history and certain features of the recorded illness are strongly suggestive of their rheumatic origin.

The many and varied conditions under which the members of this group of skin diseases occur, either singly or in combination, seem to indicate that there is not a uniform causative agent, but that different agencies may be responsible. It is not unreasonable to suppose that among these is the causative agent of rheumatic fever.

These cases were from the service of Dr. A. C. Brush, Dr. J. R. Stivers, and Dr. C. S. Cochrane, at the King's County Hospital, and I desire to acknowledge their kindness in permitting me to make this report.

ACQUIRED HEMOLYTIC ICTERO-ANEMIA.

WIDAL'S SYNDROME.

By Wilfred M. Barton, M.D.,

PROFESSOR OF THERAPEUTICS AND PHARMACOLOGY IN THE GEORGETOWN UNIVERSITY, WASHINGTON, D. C.

Acquired hemolytic ictero-anemia, a disease, or syndrome, a knowledge of which is of very recent date, is characterized by the development during adult life of icterus, accompanied by anemia; in other words, an ictero-anemia. The peculiar features attached to this condition, and raising it to the dignity of a special pathological entity, are enlargement of the spleen, urobilinuria, and characteristic changes in the blood. The differentiation of this particular type of icterus is due principally to Widal, whose first article on the subject appeared in November, 1907.[1]

[1] Bull. et mém. Soc. méd. des hôp. de Paris, 1907, 3d ser., No. 31, p. 1127.

As early as 1900 Minkowski[2] described a condition of congenital icterus characterized by chronic jaundice often hereditary, urobilinuria, splenomegaly, and renal siderosis. Several cases of this form of chronic congenital icterus have been since reported, and inasmuch as Chauffard[3] first showed that the resistance of the red corpuscles is diminished in this type of icterus, it has been called the Minkowski-Chauffard syndrome. In both the congenital and acquired forms of ictero-anemia the changes which take place in the blood have attracted much attention and have been the subject of much investigation, all of which has tended to show that both of the prime objective symptoms, the icterus and the anemia, are dependent upon hemolysis, and furthermore that the hemolysis is intimately connected with, if not absolutely dependent upon, an abnormal fragility of the red blood corpuscles.

In the ordinary forms of retention or biliary icterus, the resistance of the red blood corpuscles is increased. This was first shown in 1902 by Vaquez and Ribierre,[4] who based their conclusions upon the notation of the beginning and ending of hemolysis in a series of differently graduated saline solutions, each containing a drop of the patient's blood. A slight modification of this technique, which will be later described, has been employed in determining the existence of an abnormal fragility of the red blood corpuscles in cases of congenital and of acquired hemolytic ictero-anemia. The present article will deal exclusively with the acquired form.

Eight cases of this syndrome with their hematological findings, including one case in which an autopsy was performed, have been reported in the literature. I have observed one case during the last summer (August, 1909) in Professor von Noorden's clinic in Vienna, under Docent von Jagic. The following is a list of the authors who have reported cases:

F. Widal, in November, 1907, reported the first two observations of this disease, both of which cases he followed for two years, their subsequent histories being made the basis for a second report, which appeared in July, 1909.[5] W. Oettinger,[6] in October, 1908, reported the history of a case in which death occurred from an intercurrent pneumonia. The report includes a study of the autopsy findings. E. Saquepée,[7] in October, 1908, reported two cases, in both of which malarial parasites were found in the blood. P. Le Gendre,[8] in January, 1909, reported one case. Ritter von Stejsal,[9] in May, 1909, reported two cases observed in von Neusser's clinic in Vienna.

[2] Verhandl. des 18 Kongr. f. innere Med., Wiesbaden, 1900.
[3] Semaine médicale, January 16, 1907.
[4] Soc. de biol., July 26, 1902, p. 1074.
[5] Bull. et mém. de la Soc. méd. des hôp. de Paris, 1909, No. 25, 3rd ser., p. 73.
[6] Ibid., 1908, No. 31, 3rd ser., p. 391.
[7] Ibid., p. 361.
[8] Ibid., 1909, No. 3, p. 112.
[9] Wien. klin. Wochnschr., July 22, 1909, No. 19, p. 661.

The case seen by me has not been reported up to the present time. The following description of the symptomatology and pathology of this syndrome is based upon these cases.

SEMEIOLOGY. Acquired hemolytic icterus is more common in females than in males. Six of the cases were in females, and three in males. The family history was practically negative in all of the cases. A history of tuberculosis in the family was noted in one case, cancer of the stomach in two, and chlorosis in one. In none of the cases was heredity a factor. The ages of the patients, at the time of development of the disease, ranged from sixteen to sixty-seven years, and were as follows: Sixteen, nineteen, twenty-one, twenty-two, twenty-nine, thirty-four, forty-one, forty-two, and sixty-seven years.

The previous histories of the cases are devoid of any common factor to which an etiological significance can be assigned. The following brief protocols furnish all the facts in each case, which are important in this respect.

CASE I.—Measles, variola, ischiorectal abscess followed by rectitis for nearly a year prior to the development of icterus.

CASE II.—Abortion at the second month, followed by hemorrhages without sepsis, lasting nine weeks.

CASE III.—Acute rheumatism with cardiopathy, hepatic colic.

CASE IV.—Intermittent fever.

CASE V.—Quartan fever, bilious attacks, with hematuria. Intermittent fever.

CASE VI.—No antecedent illness.

CASE VII.—No illness antedating the commencement of the disease.

CASE VIII.—Pleurisy with effusion, variola, and diphtheria in childhood. Personal case; no sickness prior to attack; healthy, but not vigorous.

The disease has begun in all reported cases rather insidiously. The first symptoms noted were indefinite, such as malaise, weakness, palpitation, vertigo, and dyspnœa on exertion. Headache or peculiar subjective sensations in the head may be present. These symptoms may arise independently, or may occur associated with more definite pathological states, such as an abortion, rheumatic cardiopathy, malarial fever, etc.

The patient soon notices a yellowish discoloration of the skin, or this may be discovered by friends or by the physician. This icterus or subicterus involves the skin of the trunk and extremities, frequently also the conjunctivæ and mucous membranes, and is of varying intensity. The jaundice is found upon further examination, to be peculiar in that the typical concomitant symptoms of an ordinary retention icterus are absent. There is no itching or pigmentation of the skin, no lesions of scratching, no bradycardia, and no emaciation. Furthermore, the stools are normal in color, and the urine, though dark in color, contains urobilin but no bile pigment.

Developing simultaneously with the icterus is a state of anemia manifested by weakness, fatigue on exertion, or even extreme prostration, pallor of the skin and mucous membranes, low blood pressure, and hemic murmurs. The earliest objective syndrome is therefore an icterus combined with anemia. The anemia has been found to be associated with and dependent upon profound changes in the blood. These will be later described.

Besides the icterus and anemia, a third symptom is present which is quite characteristic—enlargement of the spleen. Splenomegaly has been noted in all the reported cases, and was present in the case observed by me. The organ is also tender upon pressure, and in some of the cases there are spontaneous pains felt in the left hypochondrium. The spleen may be palpable below the ribs, and occasionally a perisplenic fremitus may be felt upon manipulating the organ. The upper border may be found upon percussion in the seventh intercostal space in the mammary line. In one case its vertical diameter was 17 cm., its transverse 20 cm. As will be later mentioned, the spleen undergoes variations in size during the course of the disease, and these variations coincide with the exacerbations and improvements which characterize the affection, and serve to differentiate it from certain chronic anemias accompanied by stable tumor of the spleen. The heart examination is usually negative, except for anemic murmurs, which are sometimes audible. The pulse is usually somewhat faster and weaker than normal. The liver is usually somewhat enlarged, and in one case was palpable below the ribs and tender. In two of the cases, however, it was absolutely normal. There is usually no history of biliary colic (exception in one case).

The urine is usually dark in color and scanty, and contains urobilin, often in considerable quantities. Bile pigment is usually absent (two exceptions). The icterus, therefore, in the great majority of cases is acholuric. During the paroxysms the temperature is sometimes elevated.

Course, Duration, and Termination. After an insidious onset the disease, becoming established, tends to become chronic in the majority of instances, and to undergo a series of peculiar variations, in which all of the symptoms, objective and subjective, become alternately aggravated and improved. In order to illustrate these features more definitely, a brief outline of the course of the disease in all the reported cases will be given.

Case I (Widal).—Following an ischiorectal abscess and proctitis the symptoms insidiously developed at the end of a year. For two years the condition remained stationary. At this time a cholecystectomy was performed for supposed biliary calculi. None were found. The icterus had lasted seven years when she entered the hospital in May, 1907. The disease underwent several improvements and relapses, and did not finally disappear until September, 1908, sixteen

months after admission and over eight years from the beginning of the disease.

CASE II (Widal).—After an abortion in February, 1907, followed by hemorrhages lasting nine weeks, the patient developed the disease and entered the hospital June 20, 1907. For over a year the disease underwent several improvements and relapses. On two occasions the patient left the hospital improved, but returned with symptoms aggravated. Recovery finally took place in September, 1908, fifteen months after admission.

CASE III (Oettinger).—The patient was a rheumatic cardiopath and sufferer from attacks of hepatic colic. The disease developed insidiously over six months prior to admission to the hospital in October, 1908, which she sought on account of a severe bronchitis. The patient developed pneumonia, and died December 14, 1908.

CASE IV (Saquepée).—The patient entered the hospital July 10, 1908, for intermittent fever. The icterus developed on the twelfth, and only lasted eight days. The patient remained four weeks in the hospital, and was discharged cured except for slight anemia. The diagnosis was made on the blood findings.

CASE V (Saquepée).—The patient entered the hospital July 24, 1908, with intermittent fever and a history of malaria for six months. Icterus appeared on the day before entrance, and lasted nine days. The diagnosis was made on the blood findings.

CASE VI (Le Gendre).—The patient was a woman without antecedent disease. Three years before admission to the hospital she developed icterus accompanied by gastric disturbances. At the time of admission the symptoms had improved. She was under observation for nearly four months, and left the hospital practically recovered.

CASE VII (Stejsal).—The patient was a girl with negative antecedents. The disease began insidiously two years before admission to the hospital, November, 1906. During this period the disease had amended and relapsed twice. The patient was under observation intermittently until the spring of 1909, when the symptoms disappeared. During this space of two and one-half years the disease underwent several exacerbations and improvements, and during one of the latter the patient went home and remained for over a year. The disease lasted in all over four years.

CASE VIII (Stejsal).—The patient had pleurisy in childhood; the chest was somewhat deformed. Five months before admission to the hospital, in November, 1908, the disease developed. Undergoing several variations, the patient improved sufficiently at the end of a month to leave the hospital, but suffered a relapse in February, 1909.

CASE IX.—Personal observation (not reported). The disease developed insidiously six months prior to admission to the hospital in July, 1909. The patient was under treatment, in September 1909.

It will thus be seen that with the exception of the two cases of

malarial infection, in which the existence of acquired hemolytic icterus was accidentally discovered upon blood examinations, the cases all show a certain degree of chronicity. The disease in the majority of cases has developed insidiously, often without apparently adequate cause, and after its inception has shown a tendency to endure with varying periods of aggravation and regression for many weeks or months or even years. That the disease tends to recover is demonstrated by the outcome of the cases. In only one instance did death occur, and in this the exitus was due to an intercurrent pneumonia. Recovery in the malarial cases was extraordinarily rapid, and took place in each instance in a little over a week.

PATHOLOGY. The complete hematological examinations which have been made in all of the reported cases have added much to our knowledge of the condition and thrown some light upon its pathology. Two aspects of the blood examinations are to be considered: (1) The globular fragility, and (2) the morphological and miscellaneous changes.

1. *The Globular Fragility.* Acquired ictero-anemia, with its accompanying urobilinuria and splenomegaly, has been found to be hemolytic. The hemolysis seems to depend not so much upon the serum or plasma, nor upon toxic agents contained in these, but upon an absolute increase in the fragility of the red blood corpuscles. Widal and his collaborators found that this fragility existed only when the corpuscles were removed from the blood; that is, deplasmatized. Other observers (Stejsal), however, have found the corpuscular resistance diminished in the total blood as well as in mixtures of deplasmatized corpuscles, though it was less evident in the former than in the latter.

The technique of the examinations was about as follows: Blood was removed by puncturing a vein or finger tip, collected in an isotonic solution of potassium oxalate, and centrifugated. The plasma being discarded, the corpuscles were washed with 0.9 per cent. solution of sodium chloride. In order to determine the actual resistance of these corpuscles, solutions of sodium chloride in distilled water of different titrations were prepared. To effect this a series of small glass tubes (34 in number) were used. Into these tubes distilled water was placed in progressively increasing amounts, beginning with two drops in the first, 4 in the second, 6 in the third, etc., up to the last, which contained 68 drops of distilled water. Then in the first tube 68 drops of normal salt solution (0.9 per cent.) were placed, in the second 66, in the third 64, etc., until in the last tube 2 drops were put. The tubes were then shaken. The first tube contained, therefore, a solution of sodium chloride 0.68 per 100; the second, 0.66; the third, 0.64, and so on until the last contained 0.02 per 100. A drop of the deplasmatized corpuscles was then placed in the tubes, beginning with No. 1, and the exact point noted when hemolysis commenced; that is, when a yellowish tint appeared

in the fluid. This was sometimes found to occur in tube 0.58; intense hemolysis in tube 0.44, and complete hemolysis in tube 0.38. With the total blood in Widal's cases initial hemolysis usually begins in 0.46, intense hemolysis in 0.42, total hemolysis in 0.36, which demonstrated, according to this observer, that the blood corpuscles were abnormally fragile, but that the fragility could only be demonstrated by hypotonic solutions of sodium chloride upon the deplasmatized erythrocytes. Other authors have not reached conclusions identical with Widal in this respect, but all observers have found the globular fragility diminished in every case.

2. *Morphological and Miscellaneous Changes.* A high degree of anemia has been found in every instance. During the exacerbations the oligocythemia may be profound, the lowest number of red corpuscles recorded in the cases being as follows: Case I, 2,340,000; Case II, 1,800,000; Case III, 1,586,000; Case IV, 2,800,000; Case V, 3,000,000; Case VI, 1,125,000; Case VII, 1,100,000; and Case VIII, 2,500,000; Case IX (personal observation), 3,000,000. At the same time the hemoglobin percentage is much reduced, readings of 30 per cent. (Gowers), 30 per cent. (Fleischl), 30 per cent. (Talqvist), being reported. The color index remains high, that is, 1+. The red corpuscles show poikilocytosis, anisocytosis, and polychromatophilia. Normoblasts and megaloblasts are usually present. The percentage of nucleated red corpuscles may rise as high as 5 per cent. Examined in Marcano's fluid, the erythrocytes show protoplasmic refringent granulations. The average diameter of the red corpuscles is increased.

A leukocytosis is usually present. The count in two cases was over 40,000. In five other cases the count exceeded 7500, while in one case it was but 4500. Besides the leukocytosis there is usually eosinophilia and occasionally myelocytosis. The coagulation time is only rarely altered (retarded in one case); and bacteriological examination of the blood is negative. The plasma is darker than normally and usually contains bilirubin.

One autopsy case is reported. Death was due to pneumonia. The liver was not much enlarged, but the spleen weighted 575 grams, was of abnormal shape, and contained several infarcts. Microscopic examination of the liver showed only excess of pigmentation. The spleen showed marked congestion of the pulp, localized exclusively in the columns of Billroth. The bone marrow was found undergoing marked embryonic renovation. In one case (Le Gendre) an auto-agglutination of the red corpuscles was demonstrable; this was regarded by Le Gendre as an aid in the diagnosis, because in this case nucleated red corpuscles were rare and the globular fragility was not strongly marked.

Diagnosis. Although the disease, or syndrome, possesses certain semeiologic characters, which may render the diagnosis probable by their simultaneous presence, it is only by a study of the blood that

this may be rendered certain. It is not necessary to recapitulate the symptoms of the disease, for these have been sufficiently described. The condition must be differentiated from ordinary pleiochromic or retention icterus, from pernicious anemia, and from the congenital form of ictero-anemia (Minkowski-Chauffard syndrome).

Retention icterus will be readily recognized by the acholic stools, the concomitant symptoms of ordinary icterus, as pruritus, bradycardia, etc., and the absence of characteristic changes in the blood.

In pernicious anemia icterus is usually absent. There are apt to be hemorrhages in the skin and mucous membranes, and the symptoms are rapid and progressive. Stejsal points out the fact hat the gastric chemism is not altered in hemolytic icterus, as it is in pernicious anemia, in which achylia is the rule. Examination of the blood will reveal an increase in the globular fragility in hemolytic icterus, whereas it does not exist in pernicious anemia.

In the congenital form of ictero-anemia, or so-called Minkowski-Chauffard syndrome, the patients are not much disturbed, and are quite able to attend to their usual avocations. As Chauffard has said, they are icteric rather than ill. The anemia in this condition is usually less marked, and the poikilocytosis and anisocytosis are less intense. The myeloid reaction is very slight, showing only trivial disturbances in the bone marrow. In the acquired form, on the contrary, sometimes as many as 5 per cent. of the red blood corpuscles are nucleated. In congenital icterus the average diameter of the red blood corpuscles is diminished; there is microglobuly. In the acquired form the opposite condition prevails. The chief difference between the two forms, however, lies in the fact that congenital icterus dates from early life or even from infancy or birth.

Pathogenesis and Conclusion. The fundamental stigma of hemolytic icterus is the physical or chemical change in the red blood corpuscles, which is manifested by a diminished resistance or so-called globular fragility. This fact in connection with the diminished resistance of the corpuscle toward various lytic agents (Stejsal) proves that hemolytic processes play an important part in the disease and that the anemia is not due to lack of blood formation, but to an increased destruction of the red cells. The latter fact is also proved by the marked signs of renovation in the blood.

The enlargement of the spleen has given rise to the hypothesis that the blood changes are the result of a primary disease of this organ. The variations in the volume of the spleen, coinciding as they do with the oscillations in the degree of the icterus, may, however, with equal probability, be referred to the enormous work imposed upon the organ by the destruction of the corpuscles within the organism. In support of this latter theory it may be said that in experimental hemolysis in animals the spleen has been found enlarged; also, that in the only case in which an autopsy has been

performed, the histological changes in the spleen were undoubtedly secondary to exaggeration of function.

Whether the pigment which produces the icterus is formed exclusively within the blood or entirely within the liver, or by a combination of these processes, is debated. The absence of biliary acids in the blood and in the urine, and consequently of all symptoms of taurocholic intoxication, argues in favor of the first hypothesis, namely, that the pigment is formed within the blood. The blood plasma seems absolutely free from hemolytic power, and therefore plays no part in the hemolysis. The two cases reported by Saquepée prove beyond doubt that the malarial parasite can occasionally increase the globular fragility sufficiently to produce the disease.

In conclusion it may be said that, inasmuch as eight cases of this syndrome have been reported in the past two years, and that others have been observed, although they have not yet found their way into the literature, the clinician should be on the lookout for the disease in all cases of acquired icterus associated with anemia in which the spleen is enlarged, the stools are normal in color, and the signs of taurocholemia are absent. A careful examination of the blood in these cases will settle the question.

TYPHOID BACILLI CARRIERS AND THEIR RELATION TO PUBLIC HEALTH.

By J. P. Simonds, M.D.,

SUPERINTENDENT OF THE BACTERIOLOGICAL LABORATORY OF THE INDIANA STATE BOARD OF HEALTH, INDIANAPOLIS.

During the last five years a large number of cases have been reported, chiefly in Germany, in which persons have been found to discharge typhoid bacilli in their excreta for periods of from six weeks to more than fifty years after an attack of enteric fever. Frosch[1] divides these so-called bacilli carriers into two groups: those who excrete bacilli for less than three months, and those who excrete them for three months and longer. The latter class constitute the chronic bacilli carriers, the "Dauerausscheidern" of the Germans.

That such persons may be a menace to public health has been amply proved by epidemics that have been caused by them. Epidemics due to bacilli carriers are characteristically sporadic in occurrence, are limited in distribution to the immediate vicinity of the carrier himself, or to an area supplied by certain food products

[1] Klin. Jahrb., 1908, xix, 537.

handled by him, and follow the carrier when he moves from one community to another.

Lentz[2] reports a case in which typhoid bacilli were found in the feces of a patient forty-two years after an attack of typhoid fever. Kutscher[3] mentions a patient who excreted bacilli thirty years after an attack of typhoid fever; during this time the patient suffered from cholecystitis.

One of the most famous cases in the literature is that reported by Kayser.[4] In a certain bakery in Strassburg it was observed that practically every new employee sooner or later became ill with intestinal, typhoid-like symptoms. Among the employees there were two fatal cases of typhoid fever. The blood of the woman who owned the bakery gave a positive Widal reaction in a dilution of 1 to 100. Her feces were found to contain typhoid bacilli. She had had typhoid fever ten years before. In the same city, another woman was engaged in the milk business. Seventeen cases of typhoid, two of them fatal, were traced to this woman, who was proved to be a bacilli carrier. Kayser also reports seven epidemics in a single household, due to a female who had had typhoid fever, complicated by jaundice, thirty years before, and who was still excreting typhoid bacilli. He also discovered six other carriers who were the cause of typhoid fever in others.

Klinger[5] reports a number of sporadic cases of typhoid fever which occurred in an asylum at Hördt. Inspection of the food and water supply revealed excellent sanitary conditions. Three bacilli carriers were found and isolated. Levy and Kayser[6] report a very interesting case of a woman who, in 1903, had typhoid fever. During the winter of 1905 typhoid bacilli were found in her stools on ten different occasions.

Nieter and Liefmann[7] found that typhoid and dysentery had been epidemic for many years in a certain insane asylum in which there were 900 female patients. All attempts to check the spread of the disease by attention to food and water supply failed. Examination of the stools of all the patients revealed seven typhoid bacilli carriers. A year later, Nieter[8] reported further investigation in this same asylum, and had discovered thirteen carriers among the 900 inmates.

Friedel[9] reports four epidemics between 1901 and 1905 in the Provincial Hospital of Andernach. Altogether, there were seventy cases. Examination of the milk and water supply gave no clue to the origin of the infection. Examination of the stools of all the patients connected with the kitchen, laundry, and dairy, revealed a bacilli carrier in the person of a sixty-five-year-old female, who had

[2] Klin. Jahrb., 1905, xiv, 475.
[3] Berl. klin. Woch., 1905, xlii, 1620.
[4] Arbeit. a. d. kaiserl. Gesundheitsamte, 1906, xxiv, 173; ibid., 1907, xxv, 223.
[5] Ibid., 1905, xxiv, 91.
[6] Münch. med. Woch., 1906, liii, 2434.
[7] Ibid., 1906, 53, 111, 1611.
[8] Ibid., 1907, liv, 1622.
[9] Hyg. Rundschau, 1906, No. 1, p. 5.

been in the institution for six years, and whose duty it had been to cut the potatoes and prepare the salad. She had never had typhoid so far as known, and had never been sick in the institution. Friedel[10] also reports the case of a female cook who was a chronic bacilli carrier, and who, during eight years, was in eight different families, and apparently caused twenty-four cases of typhoid fever.

Kossel[11] describes an epidemic among the customers of a certain dairy, but there was nothing suspicious about the dairy on ordinary inspection. A more thorough investigation revealed a typhoid bacilli carrier in a man who helped in milking. He had worked on the farm for twenty years, and was not aware of having had enteric fever. The proprietor was ordered not to employ this man in any way that would bring him in contact with the milk, and the epidemic immediately subsided. Several months later, another case of typhoid developed among the customers of this dairy, and investigation proved that this same man had been set to milking again.

The British Army Medical Report[12] for 1907 contains a description of an epidemic of eleven cases of typhoid among the soldiers in Kasauli, India. It was found that the soldiers' cook was a bacilli carrier. The research laboratory at that army post found three carriers among "a large number of healthy men," who had nursed cases of typhoid fever but had not themselves suffered from the disease.

Forster[13] described two epidemics among the customers of two dairies. At each dairy, among those who handled the milk, there was a female bacilli carrier. One of the carriers was the cause of six cases of typhoid fever; the other of seventeen.

Soper[14] relates the remarkable history of a female cook who, in ten years, lived in eight families, in seven of which epidemics of typhoid occurred. There were twenty-six cases in all, with one death. Each epidemic occurred from one to two months after the cook had been employed. In each epidemic the cook herself escaped. The woman refused to give any definite history of herself. Her feces contained bacilli typhoid in abundance.

Hilgermann[15] reports nine bacilli carriers, of which eight were females. Their ages ranged from twenty-one to seventy-one years. Two gave no history of having had typhoid; the others had suffered from the disease from two to thirteen years previous to discovery. One worked in the kitchen, three were housewives; the occupations of the others were not given. All together, they were the cause of typhoid fever in twenty-six other persons.

Davies and Hall[16] described two cases. One was a female cook, who caused four outbreaks among those with whom she was asso-

[10] Ztschr. f. Med.-Beamte, 1907, Heft 6.
[11] Deut. med. Woch., 1907, xxxiii, No. 39.
[12] Brit. Army Med. Rep., 1907, xlix, 97.
[13] Verhandl. der deut. path. Gesellschaft, 1907, p. 163.
[14] Jour. Amer. Med. Assoc., 1907, xlvii, 2019.
[15] Klin. Jahrb., 1908, xix, 463.
[16] Lancet, 1908, ii, 1585.

ciated; the other, a housewife, whose children simultaneously contracted typhoid fever eight months after the mother had suffered a mild attack. Both women were bacilli carriers.

Huggenberger[17] describes the case of a woman who had had typhoid fever thirty years before and whose stools contained typhoid bacilli in great numbers. During this period thirteen members of her household suffered from the disease. The family moved three times, but sporadic cases of typhoid fever always followed.

Gregg's[18] case is one of the most remarkable found in the literature. A seventy-four-year-old female bacilli carrier, who had had typhoid fever fifty-one years before, began to do all her housework and cooking after the death of her husband. He never had typhoid. Very soon after she had begun to take part in preparing the food for the table, cases of typhoid fever began to occur among her boarders. In two years, seven boarders suffered from attacks of the disease.

Dean[19] reports the case of a physician who was found to be discharging typhoid bacilli twenty-nine years after having had the disease.

Chalmers[20] gives the history of an epidemic of typhoid among the customers of a Glasgow dairy, traceable in part to a chronic bacilli carrier, and in part to a typhoid patient, among the employees of the dairy, who contracted the disease from the carrier. An epidemic of twenty-eight cases among the inmates of a reformatory was traced by Branthwaite[21] to a dairymaid who had had typhoid fever six years before.

Scheller[22] describes two interesting cases. In one of these the infection was carried in cold victuals infected by a male bacilli carrier. In the other, it had been noted that during fourteen years there had occurred seventeen cases of typhoid among the customers of a particular dairy near Königsberg, the remainder of the town remaining practically free from the disease. Investigation revealed a bacilli carrier in the person of a milkmaid, who had had typhoid fever seventeen years before, and had been employed in the dairy for fourteen years.

Albert[23] reported a mild epidemic in three families, all of whom obtained their milk from the same source. The milker was found to be a bacilli carrier. No one else in the town bought milk from this man, and the cases of typhoid were limited to his customers.

During the fall of 1908 a severe epidemic of typhoid fever occurred among the inmates of the Indiana State Reformatory at Jeffersonville. Seventy-two persons were affected, with eight deaths. An examination at the time indicated that the epidemic resulted from

[17] Correspondenzblatt f. schweiz. Aertze, 1908, xxxviii, 622, Abs. in Lancet, 1908, ii, 1163.
[18] Boston Med. and Surg. Jour., 1908, clviii, 83, 143.
[19] Brit. Med. Jour., 1908, i, 562.
[20] Ibid., 284 and 701.
[21] Ibid., 701.
[22] Centralbl. f. Bakt., Erste Abtl., Orig., 1908, xlvi, 385.
[23] Jour. Amer. Med. Assoc., 1908, li, 982, Discussion of Dr. Park's paper.

the pumping of Ohio river water into the water-mains on the occasion of a fire at the Reformatory. On the discovery of the cause, the Reformatory mains were immediately cleaned, and no more cases developed. On account of the danger of the disease becoming endemic from the presence of typhoid bacilli carriers, it seemed wise to examine the dejecta of all the ex-typhoid fever patients in the institution. This was done on April 15, 1909, about six months after the epidemic.

Dr. H. H. Smith, physician at the Reformatory, had planned and executed all the details of preparation with great care. He collected the stools of each ex-patient in a sterile vessel, and the urine in a sterile bottle. Specimens from sixty-four patients, all of whom were males, were obtained.

Cultures were made directly from the feces and urine into tubes of lactose bile. These were taken to the laboratory and incubated over night. On the next morning, plates were made from each tube, Hesse agar being the medium used. This is a semisolid medium, and in it typhoid bacilli, on account of their greater motility, form very large thin colonies, which is said to distinguish them from colonies of Bacillus coli, which are smaller and more compact. Cultures were made from every large thin colony on the plates, but typhoid bacilli were found in none of them. Many were Bacillus pyocyaneus, some were Bacillus coli, and some were other bacilli that were not identified. On the whole, this medium did not prove as satisfactory as Jackson and Melia[24] claimed to have found it. The size of the colonies, which is the characteristic feature, seems to depend not so much on the type of organism as on the position of the colony in the medium. A colony of Bacillus coli, or of almost any other organism, growing on the lower surface of the agar, between it and the bottom of the plate, will, probably influenced by capillary attraction, spread out quite rapidly and form a colony resembling very closely that of Bacillus typhosus. However, since cultures were made from all large, suspicious looking colonies, it is probable that if typhoid bacilli had been present they would have been found. That bacilli carriers were not found among these patients, was not especially surprising, as will be shown below.

The fifty-one bacilli carriers collected above were the cause of not less than 275 cases of typhoid fever in others. In 1904 and 1905, Kayser found that of 205 cases of typhoid in Strassburg, twenty-eight were traceable to "healthy" carriers. From 1904 to 1906, inclusive, Frosch found 276 cases of typhoid, traceable to 310 carriers, discovered during that time. During the same period, 6708 cases of typhoid occurred. Thus, 4.1 per cent. of all the cases were caused by bacilli carriers. In 1906, in Strassburg, there were 2080 persons sick with typhoid fever; 978 cases (47.7 per cent.) were

[24] Jour. Infec. Dis., 1909, vi, 194.

traced to their source, and of these, 746 were so-called "contact infections." Forty-nine of these cases were caused by bacilli carriers; thus, 2.4 per cent. of all cases, or 5 per cent. of those the sources of which were discovered, were due to bacilli carriers.

That bacilli carriers may be a genuine source of danger to the community is abundantly proved by the cases and statistics given above. But that their importance in spreading infection may easily be exaggerated is equally true. A sufficient number of cases has now been reported to justify drawing some tentative conclusions.

It is important, first of all, to determine approximately what percentage of typhoid-fever patients ultimately become bacilli carriers. The opinion of different investigators varies greatly.

In 1908 Park[25] found four carriers among sixty-eight persons—that is, in 6 per cent.—who had had typhoid fever more than six months before the examination was made. Lentz believes that 4 per cent. of ex-typhoid patients become bacilli carriers. In 482 cases of typhoid, Klinger[26] found that only eight (1.7 per cent.) continued to discharge bacilli for more than six weeks after the temperature became normal. He discovered twenty-three carriers in a little more than two years; all of these yielded bacilli in the stools, and eight in the urine. Among 154 cases of typhoid, Brion and Kayser[27] found that 7 per cent. still discharged typhoid bacilli in their stools after fifteen days of normal temperature. In another series of 200 cases, these authors found that 1.5 per cent. became chronic bacilli carriers. Kayser[28] found that in Strassburg 3 per cent. of all typhoid patients were discharging bacilli one year after the attack. Frosch collected the results of examinations of the excretions of 6708 ex-typhoid patients. Of these, 310, or 4.6 per cent., continued to excrete the bacilli for more than ten weeks, and of this number, 166, or 2.47 per cent. of the total, became chronic bacilli carriers.

On the basis of the figures just given one would have expected to find typhoid bacilli in the feces of less than three of the patients examined by me. Three out of every four bacilli carriers are females. Hence, the chance of finding a bacilli carrier among the sixty-four young male patients six months after the attack of typhoid fever was rather small.

It is not necessary that a person shall have suffered from a clinically evident case of typhoid fever for him to become a bacilli carrier. Flexner[29] has called special attention to the fact that a "typhoid fever . . . . may exist with very trifling symptoms, and may sometimes run so insidious a course that the condition might easily escape notice." In 1897, Remlinger and Schneider[30] claimed to have isolated B. typhosus from the stools of persons who had never suffered from typhoid fever. Klinger found twelve car-

[25] Jour. Amer. Med. Assoc., 1908, li, 981.
[26] Deut. Arch. f. klin. Med., 1906, lxxxv, 525.
[27] Johns Hopkins Hosp. Rep., 1900, viii, 241.
[28] Loc. cit.
[29] Loc. cit.
[30] Ann. de l'Inst. Pasteur, 1897, xi, 63.

riers, and at the laboratory of the British Army Post at Kasauli, India, there were found three, who gave no history of having had enteric fever, although all of them had been in close contact with typhoid patients. Of the fifty-one bacilli carriers collected above, fifteen denied ever having had typhoid fever.

Sex appears to be a factor of much importance in the etiology of bacilli carriers. Among those discovered by Kayser[31] there were twice as many females as males. Scheller[32] found twelve females among eighteen bacilli carriers, and Hilgerman[33] found eight among nine. The German Royal Commissioners in a large number of cases found that 82 per cent. of bacilli carriers were women.[34] Among the fifty-one cases here collected, there were forty females and eleven males. It is a significant fact that the ratio between the sexes among bacilli carriers is very nearly the same as that found in cholelithiasis.

The discharge of typhoid organisms in the excreta of bacilli-carriers is intermittent. The character of the diet does not seem to have any influence on the occurrence of bacilli in the stools of carriers,[35] but there does seem to be some relation between unformed and semidiarrheal stools and the presence of typhoid bacilli.

Not only is the discharge of bacilli intermittent, but the "effectiveness" of bacilli-carriers for infecting others is likewise intermittent. Just why this is true has not been discovered. Hilgerman believes this condition due to variations in virulence of the organism, there being a somewhat fluctuating, but on the whole a steady tendency toward complete loss of virulence, due to the prolonged parasitic life of the given strain of bacilli. Conradi[36] believes that "the opportunity of infection from a single contact with a bacilli carrier is most favorable either when a notorious bacilli carrier enters a strange house, or a stranger enters the house of a notorious bacilli carrier." Soper's case is an excellent example of this principle.

Davies and Hall[37] think that there is a seasonal variation in the "effectiveness" of bacilli carriers. During the early months of the year they noted an almost uniform absence of "effectiveness," which began about May and continued, more or less intermittently, until November or December. In this connection it is interesting to note that the four epidemics traced by Friedel to a bacilli carrier occurred in May, 1901; October, 1901; May, 1905; and September, 1905, respectively. This period of "effectiveness" is seen to correspond to the warm months of the year, and its real explanation, as suggested by Martin,[38] may be that during the warm season bacteria will multiply easily in certain food products, and the persons eating them will thus get larger doses of bacilli than in the cold months.

[31] Loc. cit. [32] Loc. cit. [33] Loc. cit. [34] Quoted by Frosch, loc. cit.
[35] Pratt, Peabody, and Long, Jour. Amer. Med. Assoc., 1907, xlix, 846.
[36] Klin. Jahrb., 1907, xvii, Heft 2. [37] Loc. cit.
[38] Lancet, 1908, ii, 525, Discussion of Davies and Hall's paper.

One of the most significant facts brought out by an analysis of the cases collected is that the occupation and social condition of the carrier has much to do with the likelihood of his spreading typhoid fever. Most of the epidemics occurred among the lower classes, among whom cleanliness is, to say the least, not a virtue. In this group of cases the occupations of thirty-three bacilli carriers were given, twenty-one of whom had caused typhoid fever in others. There were thirteen dairy workers, nine cooks, seven housewives, and three laundresses. From this it would appear that those carriers are most dangerous whose work brings them into contact with food products.

That the gall-bladder is a most important factor in the etiology of chronic bacilli carriers is proved by both clinical and experimental evidence. As early as 1829 Louis[39] pointed out the not infrequent occurrence of cholecystitis accompanying or following typhoid. Long before bacilli carriers had been thought of, Raimond and Faitout,[40] Fournier,[41] von Dungern,[42] Cushing,[43] Miller,[44] Droba,[45] Hunner,[46] and others had found typhoid bacilli in the gall-bladder, associated with cholecystitis or cholelithiasis, from three months to twenty years after an attack of typhoid fever. I once isolated typhoid bacilli from the gall-bladder of a patient operated on for gallstones, ten years after he had had typhoid fever. Blackstein[47] and Welch[48] and Forster and Kayser[49] injected typhoid bacilli into the ear vein of rabbits and recovered them from the bile of the gall-bladders one hundred and twenty-eight, and forty-two days later, respectively. All other organs of these animals were free from bacilli. Nieter and Leifmann[50] and Levy and Kayser[51] found typhoid bacilli in great numbers in the gall-bladders of two bacilli carriers who came to postmortem. Dehler[52] performed cholecystotomy on two bacilli carriers who showed no gall-bladder symptoms, and found typhoid bacilli in abundance.

During the course of typhoid fever, the bacilli reach the liver through the circulating blood, and from this pass into the bile and on into the gall-bladder. Josef Koch[53] examined the wall of the gall-bladder of a patient with cholecystitis, dying in the third week of typhoid. He found bacilli in the mucosa of the gall-bladder and concluded that the infection reached the mucous membrane through the blood stream, and that the bile became infected from the mucous

[39] Recherches sur la fièvre typhoide, Paris, 1829; quoted by Chiari, Verhandl. d. deut. path. Gesellschaft, 1907, p. 145.
[40] Compt. rend de la Soc. de biol., 1896, quoted by Chiari, l. c.
[41] Quoted by Chiari, l. c.
[42] Münch. med. Woch., 1897, No. 26, p. 629.
[43] Johns Hopkins Hosp. Bull., 1898, ix, 91.
[44] Ibid., p. 95.
[45] Wien. klin. Woch., 1899, No. 46; quoted by Chiari, loc. cit.
[46] Johns Hopkins Hosp. Bull., 1899, x, 163.
[47] Ibid., 1891, ii, 96.
[48] Ibid., p. 121.
[49] Münch. med. Woch., 1905, No. 31; quoted by Chiari, l. c.
[50] Ibid., 1906, liii, 1611; ibid., 1907, liv, 1622.
[51] Ibid., 1906, liii, 2434.
[52] Ibid., 1907, Nos. 16 and 43.
[53] Centralbl. f. Bakt., Beilage zu Abt., i, 1908, xlii, 54.

membrane. This is quite contrary to the view generally held. Ziegler,[54] discussing Koch's paper and sections, stated it as his opinion that bacilli first appeared in the bile and passed from there into the mucosa, just as gonococci get beneath the epithelium lining the urethra.

Drigalski[55] has shown that the bile exerts no restraining influence on the growth of Bacillus typhosus, and, as pointed out by Pies,[56] when some albuminous substance, such as an inflammatory exudate, is added, bile becomes a very favorable medium for the growth of this organism. These conditions easily arise after typhoid fever. Just as about 90 per cent. of persons who have gallstones never suffer any particular inconvenience therefrom, so chronic bacilli carriers may harbor typhoid bacilli for years without showing any symptoms referable to the gall-bladder. In this series of collected cases, gall-bladder symptoms are mentioned in only three.

On the other hand, there is strong evidence to the effect that in occasional cases the persistence of typhoid bacilli in the stools is due to the multiplication of the organisms in the lumen of the intestine itself. Drigalski,[57] Friedel, Rosenau,[58] and others have obtained typhoid bacilli in almost pure culture from the stools of bacilli carriers. In some cases they may entirely replace the colon bacilli, normally found in feces.

The question of the proper handling of chronic bacilli carriers is an important one. A number of measures have been suggested and given more or less trial. Dehler[59] did a cholecystotomy on two cases, with complete disappearance of typhoid bacilli from the stools. This treatment, of course, is too radical for general use, especially since Forster[60] mentions the case of a paratyphoid bacilli carrier on whom a cholecystotomy was done for gallstones without disappearance of bacilli from the stools.

After Crowe[61] reported that hexamethylenamin, when given in doses of 75 grains per day, is excreted in the bile, and "exercises a decided bactericidal action," it was thought that the administration of this drug would furnish an effective method of dealing with chronic bacilli carriers. But results have not come up to expectations. The patient originally described by Soper received from 100 to 150 grains of hexamethylemanin a day without effect.[62]

Isolation, which in some cases would be equivalent to imprisonment for life, would be unjust and probably would not be tolerated. At last report, Soper's patient had been kept in confinement for sixteen months without results.

[54] Ibid., S. 56.
[55] Centralbl. f. Bakt., Erste Abtl., Orig., 1904, Band xxxv, quoted by Chiari, loc. cit.
[56] Arch. f. Hyg., 1907, Band lxii, S. 107; quoted by Forster, Verhandl. der deut. path. Gesellschaft, 1907, p. 166.
[57] Loc. cit.
[58] Jour. Amer. Med. Assoc., 1908, li, 882, discussion of Dr Park's paper.
[59] Loc. cit.
[60] Loc. cit.
[61] Johns Hopkins Hosp. Bull., 1908, xlx, 109.
[62] Pork, loc. cit.

As already pointed out, the majority of bacilli carriers who have been the cause of typhoid fever in others, have been persons who handled certain food products, especially those used in a raw state. This suggests a practicable way of dealing with a source of infection of this kind. When a bacilli carrier is discovered among the employees of a dairy, restaurant, or other food-producing or food-distributing establishment, such an employee can be compelled, under the new health laws of Indiana, to seek other employment. The danger of his spreading infection will thus be greatly reduced, although not entirely eliminated.

In conclusion, and by way of summary, I may say, first, there is ample evidence for considering the danger of the spread of typhoid fever by chronic bacilli carriers as worthy of the attention of health officers; second, epidemics caused by bacilli carriers are characterized by the occurrence of small groups of cases at intervals of a few months in the immediate vicinity of the carrier, or in the territory supplied by some food product handled by him; third, the most practicable way of reducing the danger to the public from these individuals is by excluding them from work that brings them in contact with food products.

CHRONIC NEPHRITIDES, DUE TO ACUTE SYSTEMIC INFECTION.

By Heinrich Stern, M.D.,
PHYSICIAN TO ST. MARK'S HOSPITAL, NEW YORK.

In spite of the universally accepted fact that chronic renal disease may be one of the more or less remote sequences of a systemic infection, it is, nevertheless, true that entirely too little attention has been and is bestowed upon the connection between acute systemic infection, that is, the transmission of the infective agent by the blood current, and a considerable number of permanently injured kidneys. The infectious origin of a chronic nephritic state is generally only then recognized when it has developed as the direct continuation of an attack of acute or subacute nephritis that has arisen on the basis of an acute infection, or when the chronic nephritis has supervened in the course of long-established or chronic instances of infections like malaria, tuberculosis, or syphilis.

It has ever been the dictum of experienced clinicians that urinary findings like albumin, large numbers of blood cells and renal epithelium, and epithelial and granular casts can be attributed to a systemic infection of the kidney only when originating in the course of a pronounced acute infectious disease. While this clinical viewpoint leaves nothing to be desired as far as conservatism is concerned, the

physician generally cannot furnish any other but clinical evidence that in a given case the renal involvement is due to a systemic invasion. To prove positively a causal connection in such instances is extremely difficult or well nigh impossible when the patient remains alive, and the necropsy may or may not reveal the specific pathogenic bacteria in the kidneys. Still more difficult it would be to establish an etiological relationship between an existing chronic nephritis and a systemic infection that had been of a more or less transitory nature.

In cases of this kind the effect endures while the cause has been removed months or even years ago, and it is, of course, out of the question to be able to demonstrate the original materia peccans in either blood or kidneys. Nevertheless, the great amount of accumulated clinical evidence prompts us to regard acute systemic infection as one of the causes of chronic renal disease.

The scope of this article is limited to a consideration of the relationship of acute systemic infection to chronic nephritides; it embraces, therefore, clinical experiences concerning acute infectious diseases, like scarlet fever, diphtheria, pneumonia, influenza, measles, etc., which may give occasion to chronic renal damage, but does not include any data anent renal involvement as the consequence of gonorrhea and affections starting from the lower genito-urinary tract, which may invade the kidneys in a direct manner, and chronic infections like tuberculosis, syphilis, or chronic forms of malaria.

The typical renal involvement concomitant with or following an acute infectious disease is of a parenchymatous nature. The chronic nephritic states evolving from the acute processes, it stands, therefore, to reason, tend to assume or rather to perpetuate this parenchymatous character. Roughly speaking, however, not more than 50 per cent. of the pertaining chronic nephritides are predominatingly parenchymatous. In about 20 per cent. of the cases indurative processes follow in the wake of acute parenchymatous inflammation, or supervene in the presence of subchronic or chronic parenchymatous states, and in at least 30 per cent. of the cases amyloid lesions concur with the original parenchymatous affection.

The lesions in some forms of acute nephritis are of brief duration, and the kidneys recover their normal state and function just as do the lungs after an attack of lobar pneumonia. Other types of acute nephritis are characterized by lesions tending to chronicity, and the original condition of the kidneys will never be restored. In nephritides ensuing in or following scarlatina and diphtheria, some of the lesions are usually of a permanent nature; the same is also the case in nephritic states due to other acute infectious diseases, although the permanent lesions occur here much less frequently and are generally of a milder degree. With these irreparable lesions as a foundation, true nephritis of a chronic nature will sooner or later supervene in nearly every case.

The direct transformation of an acute nephritis into a chronic form has been observed in comparatively few instances only; however, the successive transition from an acute nephritic process through subacute and subchronic stages, to the chronic condition can be traced clinically with more or less accuracy in a considerable number of cases. The successive transformation may occur within some weeks or may take many years. When the process is diffuse and purely parenchymatous, it has the disposition rapidly to assume the chronic form.

There are cases in which a chronic nephritis is not recognizable for long periods, in which there is no demonstrable connection between an acute renal inflammation which has occurred many years previously and an existing chronic nephritis. In such instances we may have to deal with indurative processes of varying degree and intensity. Renal induration may either set in when the parenchymatous nephritis is still fresh, or it may not be called forth until it has progressed to a certain stage. It is also possible that latent or limited indurative metamorphosis is occasionally present prior to the establishment of the parenchymatous inflammation, and that the latter stands at the foundation of a renewed or greater activity of the process of induration. Preëxisting indurative lesions, however, bear a primary and not a secondary character, as do the particular indurative occurrences under consideration.

Secondary renal induration, which finally leads to sclerotic kidney, may form a terminal stage of either acute, subacute, or subchronic conditions of parenchymatous inflammation. After a time, the indurative process which has brought the parenchymatous degeneration to a standstill, may itself attain a certain degree of latency. It is during this period of comparative latency, which may occasionally endure for a number of years, that the existing renal lesions remain often unrecognized, and that the connecting traces between the original acute renal inflammation and an eventual conspicuous final nephritis become more or less obliterated. On account of the concealed syndrome during the latent period of induration, the final nephritis which evinces itself not only by the urinary findings, but also by well-authenticated systemic phenomena, is often erroneously held to be a comparatively new affection. This is especially the case when the patient has just passed through an attack of illness, which may have stimulated the old nephritic process to renewed activity. At other times, the manifest nephritic state has been described, especially by the patient himself, as being of spontaneous production.

An acute infectious disease may thus be the original cause of a chronic renal affection in which indurative processes predominate. Progressive renal induration occurs so frequently in the absence of any determining systemic factor and in individuals who had at one time been affected with an acute infectious nephritis, that I have to

reiterate my opinion, expressed on a former occasion,[1] namely, that the majority of chronic interstitial nephritides, not due to constitutional causes, is the consequence of an acute infectious disease.

The affected kidneys become readily subject to amyloid degeneration. This may ensue on top of the diffuse (parenchymatous) processes within a few months after the onset of the latter. The amyloid transformation, however, which interests us most on this occasion is that which occurs together with chronic parenchymatous or secondary indurative nephritis. Amyloid degeneration of the kidneys, always supervening in both organs, is never a primary process. It is nearly always produced in the wake of certain cachectic conditions, the underlying abnormal blood composition of which may bave been evoked by long-continued renal disease. Not infrequently amyloid kidney is mistaken for parenchymatous or indurative nephritis. With the former it has, in common, the large amount of urinary albumin, with the latter the scanty number of morphotic elements in the urine; these consist in the greater part of hyaline and finely granular casts. In the rarest of instances amyloid degeneration is traced back to an acute nephritic attack.

The history of an individual with chronic nephritis will often reveal the fact that he has at one time been afflicted with an acute nephritis, following an attack of an infectious disease like scarlet fever, diphtheria, pneumonia, influenza, measles, erysipelas, rheumatic or typhoid fever, smallpox, parotitis, etc., and that soon afterward the nephritic symptoms have vanished. In many of the pertaining cases, however, there ensued but a temporary arrest of the nephritis, and in the absence of subsequent urinary examinations, this temporary cessation was translated to mean a permanent amelioration. Furthermore, the abatement of the albuminuria has been, and still is often, interpreted as the abatement of the nephritic process itself, a misconception of facts to which many a fatality has to be ascribed. Albuminuria may occur without any inflammatory renal changes, as I have again shown in a recent communication,[2] and in certain nephritic states the albuminuric phenomenon may not ensue at all for a long period or may be temporarily suspended.

The records of the last 200 cases of chronic nephritis that have come under my observation give the history of one or more acute infectious diseases at some period during the life of the patients in 192 instances. Among these an acute renal involvement had been positively set up in at least 121 cases. Moreover, the histories following the attack of the infectious disease in 56 or 58 of the remaining cases strongly point to the occurrence of an acute nephritic process. (Among these should be included 4 cases of tuberculosis, 5 cases of syphilis, and 1 case of chronic malaria.) Ignoring, however, all the

[1] Heinrich Stern, The Renal Complications and Sequelæ of Influenza, Med. Rec., January 11, 1908.

[2] Heinrich Stern, Compensatory Albuminuria, Med. Rec., June 26, 1909.

unconfirmed instances, we find that renal involvement had existed in 62.5 per cent. of the cases that had been acutely infected. The frequency of renal involvement after the various infectious diseases was as follows: scarlet fever, 38 cases; diphtheria, 35 cases; influenza, 16 cases; pneumonia, 12 cases; measles, 12 cases; typhoid fever, 6 cases; rheumatic fever, 1 case; erysipelas, 1 case.

The chronic nephritic processes evolved from or supervening some time after the occurrence of the 121 positive acute nephritides exhibited a preponderating parenchymatous character in 58, the features of secondary induration in 24, and of amyloid degeneration in 39 instances.

Of the 200 quoted instances of chronic nephritis, 156 occurred in men, and 44 in women. This, however, is not the normal proportion of the sexes as affected by chronic nephritis, for the reason that my records comprise the histories of a comparatively large number of male applicants for life insurance who were referred to me after they had been rejected by the examiners of the companies. The age of the youngest individual was eight, of the oldest, sixty-four years.

The 121 cases of chronic nephritis furnishing a positive history of acute renal involvement during or after an infectious disease, had ensued in 97 men and 24 women. The ages varied between eight and forty-nine years. (None of the older individuals could produce definite data concerning the acute nephritis in the wake of an infectious disease.) The time which had elapsed since the occurrence of the acute nephritic state amounted to from ten months to twenty-six years. As a matter of course, the indurative instances were those which had lasted longest.

From the foregoing remarks it does by no means follow that an acute nephritis of infectious origin always stands in direct relationship to a chronic nephritic state that supervenes in after years. However, we are justified in assuming that kidneys, acutely affected at one time, are thereafter possessed of a lowered degree of resistance in many, and of a diminished functional activity in some, of the instances. Exciting causes which will not readily affect the entirely sound kidney to any extent, bear upon a weakened organ and tend to call forth therein further damage. Exposure to telluric conditions of cold and dampness, continued physical and mental strain, excesses in baccho et venere, factors which are generally held to be excitants of renal disease, will be conducive to the production of nephritis in proportion to the lack of resistance of the kidneys. Even the slightest provocation may affect the non-resistant kidney and occasion intermittent or permanent manifestations of an active morbid process. While, therefore, an acute nephritis is not necessarily followed by a chronic degenerative renal state directly traceable to it, it evidently prepares the soil for subsequent invasions and textural and functional decline.

The following conclusions are offered:

1. Kidneys, acutely affected at one time, are thereafter possessed of a lowered degree of resistance in many, and of a diminished functional activity in some, of the instances.

2. It is very difficult, so far as positive demonstration is concerned, to establish an etiological relationship between an existing chronic nephritis and a systemic infection that had been of a more or less transitory nature. Clinical evidence, however, prompts us to regard acute systemic infection as one of the causes of chronic renal disease.

3. The typical renal involvement concomitant with or following an acute infectious disease is of a parenchymatous nature. About half of the chronic nephritides evolving from nephritic processes that have originated during or after an acute infectious disease, are predominatingly parenchymatous; in about 20 per cent. of the cases indurative processes follow in the wake of acute parenchymatous inflammation, or supervene in the presence of subchronic or chronic parenchymatous states; and in about 30 per cent. of the cases amyloid lesions concur with the original parenchymatous affection.

4. The direct transformation of an acute nephritis into a chronic form has been observed in comparatively few instances only; however, the successive transition from an acute nephritic process through subacute and subchronic stages to the chronic condition can be traced clinically with more or less accuracy in a considerable number of cases.

PERNICIOUS ANEMIA, WITH REMISSION FOR SEVENTEEN YEARS.

By Alexander McPhedran, M.D.,
Professor of Medicine in the University of Toronto.

The object of this article is chiefly to record a case of pernicious anemia, in which there was a remarkably long period of complete remission of symptoms, amounting to a cure for some sixteen years, with final relapse, showing all the characteristic symptoms and pursuing a truly progressive course to a fatal ending.

The case, that of a physician, was one of five previously reported.[1] At that time Dr. P., aged forty-nine years, was engaged in a large country practice. He had been losing strength and growing anemic for a year or two. He became much worse, and was compelled to cease work in the spring of 1889; he soon became very ill, with a temperature of 104° F. and marked delirium. There was severe

[1] Medical News, October 11, 1890.

vomiting and diarrhœa. The skin was very pale, but with a decided lemon tinge. The blood showed the characteristic appearances of pernicious anemia; 730,000 red blood corpuscles per cubic millimeter. There were retinal hemorrhages in both eyes. He had recurrent chills irregularly, with high temperature, delirium, vomiting, and diarrhœa for nearly three weeks, after which he began to improve, slowly at first, but later more rapidly. Arsenic was given early and gradually increased until 45 minims of Fowler's solution was taken daily. In a month the corpuscles reached 1,700,000, and at the end of another month 3,250,000. His general condition was correspondingly improved. Five months later he was apparently quite recovered and able to resume his practice. His blood contained then nearly, if not quite, the usual number of practically normal red corpuscles per cubic millimeter. He remained well and in constant practice until the autumn of 1906, when he found himself growing weak and unequal to his work. When examined in the following March, 1907, he was very weak, the body surface markedly yellowish, the appetite poor, the bowels constipated, with occasional diarrhœa. The blood contained 1,926,000 red corpuscles per cubic millimeter, of large size generally; poikilocytosis was marked, and both normoblasts and megaloblasts were present. The hemoglobin was 39 per cent.; white corpuscles, 4200; lymphocytes, over 30 per cent.; few eosinophiles. He improved rapidly, and by the end of a month there were over 3,000,000 red corpuscles per cubic millimeter; no megaloblasts were found, and the eosinophiles were numerous.

In the early summer there were over 4,000,000 red corpuscles per cubic millimeter, and he was feeling correspondingly improved. He went to the Canadian Northwest as far as the Rocky Mountains in the summer. While travelling, vomiting and diarrhœa were troublesome, and he became much prostrated. With rest he improved steadily and was fairly well on his return in November. He was not seen until January, 1908. He looked well, although his strength was failing since his return from the West; appetite was fair; tongue clean, no stomatitis, gums healthy, teeth having been removed some years previously. He had some diarrhœa for a day or two, about every two weeks; stools liquid, but not offensive. The blood contained about 3,500,000 red corpuscles per cubic millimeter, showing only slight variation in size and shape. From that time on his condition became generally worse, with slight improvement for a few days from time to time. He had frequent recurrences of vomiting and diarrhœa, the stools being copious and liquid. During the month before he died he was scarcely more than semiconscious; his general condition was that of marked pernicious anemia. Death took place May 17, 1908, at the age of sixty-eight, over twenty years after the first symptoms of his first attack showed themselves. He recovered from the first attack in the autumn of 1889, and continued in good health until 1906, a period of seventeen years. During these

years there was no opportunity for making an examination of his blood or general condition, as he felt in very good health and his capacity for work was excellent. He, therefore, considered examinations unnecessary. After his death, unfortunately, there was no opportunity for an autopsy.

So far as I can determine from the literature of pernicious anemia, the duration of the disease and length of complete remission during which he was in good health, are much the longest on record. The recovery from the first attack had been of such long duration that I had for years regarded it one of complete and permanent recovery. "Call no man happy until he is dead" is certainly applicable to pernicious anemia. Had he died a year or two earlier from some intercurrent illness, such as pneumonia, or by an accident, his case could, with good reason, have been recorded as one of permanent recovery from pernicious anemia. As to the justice of such a conclusion much will depend on the definition we give of a recovery. In the acute diseases, and in many chronic ones, recovery takes place and later another attack occurs from a subsequent infection, as, *e. g.*, in pneumonia, erysipelas, and malaria among the acute, and tuberculosis and even syphilis among the chronic diseases. If we apply the same reasoning to pernicious anemia, some cases doubtless do recover, and this case should be included in the list, as there is scarcely a doubt that his blood would have shown a normal appearance during those years of good health, had it been examined.

It is probable that all the cases of permanent recovery on record have also suffered a relapse if they were not cut off by some intercurrent disease. One can scarcely agree with the statement that "When a patient has been six years free from trouble it seems safe to conclude that no recurrence will occur," or that any such group of cases demonstrate the possibility of permanent recovery.[2] Exception must be made of the puerperal cases. One such was included in the five reported in 1890.[3] This woman made a complete recovery and has remained well since. The diagnosis as one of pernicious anemia was at least doubtful, and was so regarded at the time; the subsequent history renders it probable that the anemia was due to toxemia caused by the unsanitary conditions of the house in which she was then living.

This case affords a striking illustration, in the first place, of the uncertainty of the course and duration of pernicious anemia, and, in the second place, of the certainty of the final ending, if the sufferer in the meantime does not succumb to some intercurrent affection. In a number of cases the toxemia and prostration are so great at some period of their history, that death has been daily expected, and yet, without apparent cause, they have improved and become able to be about in a few days, after which improvement has often

[2] Osler's Modern Medicine, v, 635. [3] Loc. cit.

been rapid and they have been able to resume their usual occupations. In the case of a stone mason some years ago, the prostration was so great that he was unconscious, blood-stained saliva flowed freely from the mouth, coloring the pillow, and neither food nor liquid could be given. He was, in fact, apparently *in extremis*. Yet a day later he became conscious, took food, sat up, and in two more days travelled one hundred miles to his home. He resumed his work in a few weeks, and spent an active summer. He failed again gradually during the ensuing winter and died in the spring. The designation given by Biermer of *progressive pernicious anemia* is quite inappropriate, as the disease is nearly always remittent and not progressive, in many the remission being marked and of long duration.

In addition to the irregularity in its progress, the course of the disease presents the greatest variations in symptoms. In some, and these are the most numerous cases, the digestive tract shows marked and frequent disturbance, with vomiting and diarrhœa. The stools are usually watery, and may be offensive, owing to copious secretion into the intestine and vigorous peristalisis. The mouth, as a rule, is healthy. In some cases there is, from time to time, troublesome superficial glossitis, but in none of my cases have there been the septic gums met with so often by Hunter and regarded by him as the source of the infection, which causes the disease, or, as he believes, one variety of it. In the case of Dr. P. the teeth had been removed some years before the symptoms began, and the gums were quite healthy. Well-fitting false teeth had been worn.

Signs of local disease may be slight or absent. A fair percentage of cases show early and marked symptoms of degeneration in the nervous system, any part of which may be affected. The peripheral nerves most frequently suffer as shown by local paresthesias, anesthesia, and trophic changes, especially in the skin, which not rarely presents a glossy surface and other signs of atrophy. The spinal cord is frequently affected, especially in the posterior columns, hence some ataxia. The altered sensations and anesthesia may also be due to cord changes. In a few cases the brain suffers, as shown by well-marked mental disturbance which may persist even when the patient's general condition has greatly improved. A few years ago, in the case of a physician, mental symptoms occurred early and persisted in varying degrees, even when he had improved so much that the blood contained nearly 5,000,000 red blood corpuscles per cubic millimeter, and they were of nearly normal appearance.

As to the benefit of arsenic in pernicious anemia, opinions vary. By many it is regarded as of great importance, almost as a specific; by others, an increasing number, it is looked upon as having possibly a little influence on the progress of some cases, but that it is of no benefit in the majority. Arsenic is supposed to act as a stimulant to the blood-forming tissues, increasing the production of red cor-

puscles. Gunn[4] ascribes to it the effect of rendering the stroma of the red corpuscles more resistant to destructive agencies. It has appeared to me that in the more acute cases, if in any, arsenic has a beneficial effect. In these there are the symptoms of an acute toxemia, such as fever, vomiting, diarrhœa, and often delirium. These cases not rarely bear arsenic well, as soon as the vomiting and diarrhœa have ceased, and improvement is often rapid. In such cases the symptoms are chiefly, if not altogether, due to the toxemia. In the more chronic cases with progressive symptoms, often without any acute irritative attacks, but running a slow downward course, arsenic seldom has any beneficial influence; on the contrary, it often causes stomatitis and gastro-enteric disturbance. In these cases the symptoms are possibly largely, if not chiefly, due to the secondary degenerative changes in the bone marrow and in the mucous membrane of the digestive tract. Such would seem to be true in Dr. P.'s case, at all events. In the first illness, which was acute, arsenic was well borne and the recovery was rapid, not necessarily because of the arsenic; in the second illness, even small doses of arsenic could not be given without causing stomatitis and epigastric distress. As an evidence of the beneficial effect of arsenic, it is said that those to whom it is given show a larger proportion of remissions than those do who are not so treated. But then these latter cases are usually those who cannot bear it, and include the majority of the worst cases, so that a comparison is misleading.

Many other plans of treatment have been recommended. Red bone marrow is used by Sir Thomas Fraser, and in some cases good results have followed its administration. Various sera have been used subcutaneously, also physiological salt solution. Antiseptics have been given, especially in cases with vomiting and diarrhœa; of these, probably the best are bismuth salicylate and bismuth naphtholate. These have proved useful in controlling diarrhœa. Gastric lavage in suitable cases has no doubt been of benefit, as has also colon flushing. These means of treatment are useful in some cases, but none of them have more than a limited application. In a disease subject to such marked and sudden changes, either for better or worse, it is difficult to estimate the value of any course of treatment.

The outlook in any case is not necessarily unfavorable for the immediate future, even though the condition may be marked by great prostration. The more prolonged and continuous the patient has been on the "down grade," the more unfavorable is apparently the outlook. However, in most cases temporary improvement is the rule. In the large majority of cases reported, few have lived beyond three or four years from the onset. We cannot hope to be much more successful in our treatment until we have discovered the actual cause of the disease.

[4] British Medical Journal, 1908, ii.

DIAGNOSTIC PUNCTURE IN TUBERCULOUS ABSCESSES.

By James K. Young, M.D.,
ASSOCIATE PROFESSOR OF ORTHOPEDIC SURGERY IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

The profession has become familar with puncture of the peritoneal, pleural, and pericardial cavities, with lumbar puncture, exploratory aspiration of the liver, of certain cysts and collections of localized pus, but puncture of tuberculous abscess for diagnostic verification as a routine procedure has been neglected.

From the earliest periods of medical knowledge down to the present time physicians have hesitated to evacuate cold abscesses—so-called—because of doubt as to the character of their contents. The too frequent production of mixed infection meant prolonged sepsis with all its serious complications and frequent death. If by diagnostic puncture one can ascertain to a certainty the bacteriological composition of the contents, the necessity for incision and drainage or the opposite can be definitely determined. The following paper is founded upon a personal experience which has proved the great value of diagnostic puncture in this class of cases.

The diagnostic puncture should be made with an exploring syringe veterinary syringe, or lumbar puncture syringe, or with an ordinary hypodermic syringe, since the object is not to withdraw a large quantity of fluid for therapeutic purposes, but only sufficient for laboratory examinations. The puncture should be performed under the most strict antiseptic precautions, both in regard to the preparation of the part to be punctured and the instrument employed and the hands of the surgeon. The part must be thoroughly scrubbed with green soap and sterile water, with bichloride solution, with alcohol, and finally with ether or turpentine. The hands of the surgeon should be thoroughly scrubbed with green soap and sterile water and soaked in alcohol and a bichloride solution. The syringe and needles should be thoroughly boiled for twenty minutes and kept in alcohol until used. The syringe which I use is the small glass one made for hypodermic purposes. The puncture should not be made in the most prominent or thinnest part of the collection, but through sound skin, care being taken to avoid large veins and important structures.

The pain caused by the puncture may be diminished by local anesthesia with ethyl chloride, cocaine being seldom necessary and ice and salt not being sterile. A portion of the fluid withdrawn in the syringe should be placed in a sterile test-tube prepared for the purpose of the subsequent laboratory examinations, and the remaining should be dropped upon one or more prepared slides for immediate clinical microscopic examinations. The puncture should be sealed

with sterile cotton or gauze and collodion. If the fluid cannot be withdrawn through so fine a needle, the larger exploring syringe or the Potain or other vacuum aspirator should be employed.

The exploratory puncture for diagnostic purposes should be made several days before any contemplated operation in order to use the laboratory findings in the surgical treatment of the abscess or of the primary pathological lesion. In slowly forming exudates of questionable character advantage may be taken of this delay to determine by inoculation their exact pathological character.

EXAMINATION OF THE FLUID. More important than the determination of the physical character of the fluid, the color, coagulability, odor, and transparency, is the information obtained by the microscopic examination and the culture findings. The examination should also include the cell counting, of the same character as the cytodiagnosis employed in pleural effusion. If there is a marked increase in the lymphocytes, over 50 per cent. of this should be in favor of tuberculosis, since the predominance of polymorphonuclear cells would indicate a non-tuberculous origin.

If the fluid withdrawn is sanguinolent, a careful comparison with the blood of the individual, taken at the same time will be of great value, as shown in Case II.

The presence or absence of bacteria in large quantities, such as tubercle bacilli, staphylococci, streptococci, and actinomycosis can readily be determined by this most simple microscopic examination, but the advantages of waiting for the laboratory reports are the more accurate conclusions which may be deducted by taking into consideration the physical characteristics together with the microscopic and culture findings.

If the smear slides are not satisfactory, and the culture findings are negative for tuberculosis, inoculation of guinea-pigs should be made in suitable cases. In all doubtful cases this has invariably been the my practice. These reports are, however, received so late that they are confirmatory rather than of any practical value in operative treatment.

The examination of fluid taken from 25 operative cases several days before operation by myself, all of which were diseases of the joints and some of which required excisions of the major joints, 3 being excision of the hip joints, showed 6 to contain tubercle bacilli, 6 to contain pyogenic organisms, and 12 were sterile. Among the organisms found were streptococci, staphylococci, Bacillus pyocyaneus, and pneumococci. Of the sterile abscesses, inoculation into guinea-pigs showed that 2 were negative and 1 positive for tuberculosis.

The examination of the fluid is not only valuable in determining the character of the disease, but is also important in deciding what operative measures shall be adopted. The treatment of the abscesses themselves will vary according to the findings, and in the cases

described by me in a previous paper,[1] three different groups were made according as the aspirated fluid was sterile or contained tubercle, or had mixed infection. The examination of the fluid enables the operator to decide whether an operation is immediately required, as well as the character of the operation demanded.

The following cases illustrate the value of diagnostic puncture in tuberculous abscesses:

CASE I.—R. F., a white boy, aged four years, came under my care November 26, 1906, having suffered from left knee-joint disease since June, 1905. The family history was negative, except that one paternal aunt died of hip tuberculosis. The joints presented the characteristic symptoms of tuberculous disease, being enlarged, pale, with prominent veins, the knee fixed at an angle of 15 degrees. Upon the anterior aspect of the thigh, about 6 inches above the patella, was a large abscess. The *x*-ray examination of the knee-joint showed partial destruction of the epiphysis of the femur, with thickened synovial membrane and no fluid within the joint; the diagnostic puncture showed the fluid to be sterile, and inoculation of guinea-pigs with this fluid was negative for tuberculosis.

The abscess was incised, thoroughly curetted, and closed without drainage, a firm compress was applied, and the limb was fixed in a plaster-of-Paris cast. Recovery was prompt and permanent, and there has been no return of the disease. Without diagnostic puncture the patient would have had his abscess incised and curetted and had drainage inserted for many days, with possible infection of the part.

CASE II.—J. O., aged eight years, was admitted to the Polyclinic Hospital, April 19, 1906. His parents were living and there was no tuberculous history in the family. The child had had the usual exanthemas of youth, and when five years of age he injured his right hip by falling while roller skating. After a month's treatment at home he was admitted to the hospital under my care, for flexion of the hip-joint. This was overcome and the adhesions broken up by manipulation and tenotomy of the right sartorius at its origin. In August, 1906, he received another injury by a kick on the hip, which renewed the inflammation in the hip-joint. Upon his admission in November there was some induration and swelling of the hip-joint, with enlarged inguinal glands; there was some limitation of motion, and he walked with a limp. The *x*-ray examination at this time showed changes in the cartilage of the head of the femur; his physical examination was otherwise negative. His pain increased and became excruciating, notwithstanding the use of a Buck's extension and a lateral weight applied to the upper part of the femur. On December 13, under ether narcosis, I aspirated the hip-joint and removed two drains of bloody fluid, which

[1] Amer. Jour. Orthop. Surg., 1907.

contained bone marrow, and which showed a rupture of the abscess from the medullary structure into the cavity of the joint.

The report of the laboratory findings of this diagnostic puncture by Dr. John M. Swan, of the Polyclinic Hospital, is of great value, and compared with the examination of his blood taken at the same time verified the opinion that the fluid had ruptured from the bone into the joint cavity at this time. These examinations are given side by side for comparison. The bacteriological examination of the fluid was negative for tuberculosis. The diagnostic puncture entirely relieved the pain, and he subsequently made a satisfactory recovery under mechanical treatment.

Blood Count, December 17, 1906. Differential count:	Per cent.	Specimen of fluid aspirated gave the following; about pure blood with large white cells: Differential count:	Per cent.
Polymorph. nucleated	52.0	Polymorph. nucleated	36.4
Lymphocytes	18.0	Lymphocytes	32.0
Transitional	17.4	Transitional	7.2
Eosinophiles	9.8	Eosinophiles	3.4
Basophiles	1.2	Basophiles	0.4
Myelocytes	1.6	Myelocytes	18.6
		Eosinophiles and Myelocytes	2.0
	100.0		100.0

Without the information obtained by diagnostic puncture this patient would possibly have been subjected to incision or excision of the hip-joint with prolonged drainage and the possibility of mixed infection.

CASE III.—W. G., male, aged sixteen years, came under my care January 20, 1907, suffering from tuberculosis of the left knee-joint. Five years before he had been operated on for congenital double dislocation of the hips; the left one was perfectly reduced and the other one partially reduced, the tuberculous knee for which he presented himself being in the perfectly reduced side. The examination of the diagnostic fluid showed the presence of a few streptococci and a large number of staphylococci. The joint was opened by incision through the skin on the inner side, and the division of the synovial sac by the Paquelin cautery and counter-incision in the same manner on the outer side, with thorough irrigation with a 5 per cent. of formalin solution and drainage. He made a prompt recovery. The diagnostic puncture here enabled me to drain thoroughly and promptly the knee-joint.

PRIMARY TUMOR OF THE VELUM, WITH MARKED COMPRESSION OF THE FOURTH VENTRICLE.

By Harlow Brooks, M.D.,

ASSISTANT PROFESSOR OF CLINICAL MEDICINE IN THE UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE; VISITING PHYSICIAN TO THE CITY HOSPITAL, NEW YORK.

The patient was a girl, aged eleven years. She first came under the observation of Dr. J. Constantine MacGuire, to whom I am indebted for the history and most of the clinical notes of the case. The child was born of nervous and excitable parents, and from early life had been the witness of constant domestic disturbances, so that the nervous condition that she presented had been looked upon as fully accounted for. She had suffered from various diseases of infancy, and had always been considered frail, although of about normal size and development for her age. Previous to coming under the care of Dr. MacGuire she had been ill for two weeks, suffering from a condition diagnosed as "brain fever."

On examination she showed general muscular rigidity of a spasmodic character, with slight opisthotonos. She rolled and tossed about the bed, was illogical, and had at times to be restrained. Occasionally she screamed and cried hysterically. She complained rather persistently of pains in the head. The knee-jerks were accentuated, there were no ocular disturbances manifest, and examination of the eye grounds was said to be negative. There was no Babinski reflex, no elevation of the temperature, and the pulse varied from rapid to slow. At this time a diagnosis of probable meningitis was made.

The child was removed from her surroundings, which were manifestly bad for her condition, and was placed under observation in a hospital. Here she was actively purged and put upon vigorous doses of the bromides. Under this treatment the symptoms apparently entirely cleared up, the muscular rigidity passed away, and the child was soon able to sit up and to walk about the ward. Mentally, the condition become apparently normal, cerebration and speech were quick and apparently natural in every way and the patient became cheerful and uncomplaining. Medical treatment was then entirely suspended, but the child remained under observation. With this startling result following treatment, naturally a diagnosis of hysteria was made.

Some days after apparent recovery a parent of the child was permitted to see her and, unknown to the attending physician, brought a detective, who sharply questioned the child as to alleged misdoings on the part of the other parent. The girl became very much distressed and excited, and shortly after this ordeal developed convulsive attacks of the same nature as those previously present, during which she soon died.

Postmortem examination shortly after death showed a practically normal condition throughout the entire body, except for the following lesions in the brain, which are quoted verbatim from the protocol: "The skull, scalp, and dura mater are entirely normal, but the blood-vessels of the pia-arachnoid are moderately injected. The markings of the brain are regular, symmetrical, and typical. The convolutions are, however, remarkably flattened, and palpation of the hemispheres shows fluctuation. On removal of the brain from the skull the infundibulum is found to be greatly distended, and, on its rupture, about 500 c.c. of clear cerebrospinal fluid escapes. The sella turcica is somewhat excavated, as a result of the infundibular distention, but the pituitary body is apparently normal. The optic chiasm is compressed by the bulging infundibulum and its bands are thinned and slightly atrophied. The foramen of Munro is greatly dilated, and on opening the lateral ventricles, they were found to be enormously distended from cerebrospinal fluid. The choroid plexuses are anemic, but otherwise apparently normal. Section through the cortical tissue of the cerebrum shows marked anemia, but otherwise, aside from compression, it is apparently normal. The cortical gray matter is normally thick and regular. Section of the pons, medulla, and cerebellum shows a large tumor mass, apparently originating from the velum, which covers in the floor of the fourth ventricle. As a result the floor of the ventricle and the superjacent substance of the cerebellum are greatly compressed, but neither tissue appears to be integrally invaded.

"On careful dissection the tumor can be readily separated from the cerebellum, but not from the floor of the fourth ventricle, where it is firmly attached by a more or less clearly defined adhesive pedicle, which covers it in almost the entire ventricular area. The tumor is flattened, oval in form, it measures 6 cm. in diameter, and 3 cm. from above downward. It is light pink in color, very soft, and almost pultaceous in consistence, but it shows no areas of gross necrosis. The superjacent cerebellum is very much compressed, but no areas of invasion or of degeneration can be made out in it. No strands of degeneration are grossly demonstrable in the tracts of the lower medulla or in the cervical cord, although the ventricle of this portion of the cord is somewhat dilated. The tumor has completely obliterated by compression the iter and the passage below connecting the medullary ventricle with that of the cord; this is doubtless the explanation of the condition of hydrocephalus."

"Microscopic examination of the tumor shows it to be composed of a diffuse mass of embryonic connective tissue cells, which are for the greater part of the small round-cell type. The stroma is very scanty and is largely composed of spindle-shaped cells which are evidently closely related to those which make up the chief mass of the tumor. Bloodvessels are infrequent, but the tumor is rich in what are apparently lymph passages. The smaller channels are

composed of irregularly arranged tumor cells, and only the larger vessels show a definite structure, into which adult connective tissue and endothelium enter. Portions of the velum remain still intact in the growth, though the neoplasm has evidently sprung from the connective tissues of this structure. No direct evidence of invasion of the tissue of the cerebellum or medulla can be made out."

Histologically, I am inclined to class this tumor as a sarcoma of the small round-cell variety, but in some respects it resembles a glioma. Taking into consideration, however, its evident point of origin, I believe that I am fully justified in the assumption that the growth is a sarcoma.

From a clinical standpoint the case is chiefly interesting and remarkable in that with so marked a growth complete relief of symptoms took place from time to time. It is, of course, absurd to assume that the bromide had directly to do with this amelioration, but I am rather inclined to the idea that the cartharsis, with the mental quiet and rest which the child enjoyed after removal from her home were partly responsible for the cessation of symptoms. It is, however, possible that the inhibiting action of the bromide on the activity of the ganglion cells really may have had an effect in assisting this improvement.

Manifestly, the convulsive and irritative symptoms shown by the patient when she was first seen were due to the acute hydrocephalus. It is probable that with the rest in bed and quiet of the hospital a certain amount of absorption of this fluid, with relief of the cortical pressure, took place, as a result of which the temporary improvement noted occurred. It also seems probable that the excitement induced by the painful questioning of the sensitive child caused a cerebral hyperemia, with, perhaps, increased secretion of cerebrospinal fluid, increased cortical tension, and resulting convulsions and death.

It is extremely difficult to understand why choked disk, Babinski reflex, and other evidences of cerebral compression were absent in this case. The absence of disturbances of equilibrium with so marked cerebellar compression is truly remarkable, but no more so than the absence of respiratory and cardiac disturbances when the floor of the fourth ventricle was so universally and remarkably compressed.

In so far as I have been able to determine, the case is unique, not only in symptomatology, but also in the location and character of the tumor. As a whole, it only verifies the quaint statement said to have been made by Charcot, that "there is no lesion of the central nervous system which may not exist at times without symptoms, and there are no symptoms which may not appear without lesion."

REVIEWS.

A PRACTICAL TREATISE ON FRACTURES AND DISLOCATIONS. By LEWIS A. STIMSON, M.D., Professor of Surgery in the Cornell University Medical College. Sixth edition; pp. 876; 361 illustrations and 65 monotint plates. New York and Philadelphia: Lea & Febiger, 1910.

A NEW edition of this surgical classic is of interest chiefly in relation to the additions or changes that have been made since the last one (1907). The author states that they relate largely to carpal and tarsal injuries, to midcarpal fracture-dislocations, to fractures of the acetabular floor and of the femoral internal epicondyle, and to backward dislocation of the mandible. He might have added habitual dislocation of the shoulder, as after referring (p. 620) to T. T. Thomas' excellent paper on that subject (see AMERICAN JOURNAL OF THE MEDICAL SCIENCES, February and March, 1909) he recurs to it (p. 624) and says that "in an unknown proportion of cases" Thomas' operation is an ideal one. It consists essentially in exposing the capsule through an axillary incision between the coracobrachialis and the nerves and vessels, dividing the tendon of the subscapularis, excising the new tissue, filling in the gap in the capsule, and suturing the sides of the rent to each other. He questions the advisability of dividing the subscapular tendon, but as he has himself had two satisfactory results in cases not especially adapted for the operation, as it has uniformly given similar results in the hands of its originator and of other operators, and as it removes the predisposing pathological condition, closes the capsular tear and permits of thorough inspection of the interior of the joint, the adjective—"ideal"—would seem not to be misapplied.

The amplified and considerably changed section on the fractures of the carpus embodies the results obtained by Ebermayer, Delbet, and others, and sets forth the now well established frequency of fracture of the scaphoid, which is described as an "alternative lesion" to Colles' fracture, the radius breaking more often in the old, whose epiphyses are thinner and in whom the expanded articular extremity of the bone is brittle and weakened. The characteristic clinical symptom is sharp pain on pressure in the *tabatière anatomique*, but an *x*-ray examination is often essential and always desirable.

The prognosis is somewhat unfavorable on account of the probability of limitation of flexion and extension of the wrist.

The author recommends in fresh simple cases without displacement immobilization for a month, and adds that the records show better results than those obtained by passive motion and mechanico-therapy. This seems too absolute. It is difficult to believe that *judicious* massage and passive motion would not here, as elsewhere, favor both rapid union and freedom from functional disability. When there is distinct displacement of the proximal fragment it should be removed.

Associated with this subject are the "midcarpal fracture-dislocations" in which, usually as a consequence of a fall upon the ball of the over-extended ("dorsally flexed") hand there are in addition to the fracture of the scaphoid, displacement of the semilunar and the upper fragment of the scaphoid, and subluxation of the os magnum. The new subsection on this rather rare injury summarizes the observations of Schoch and Delbet.

The symptoms are flexion of the fingers with pain on an attempt at straightening them; shortening and thickening of the wrist; slight shifting of the hand to the radial side with prominence of the ulnar end. The diagnosis must be made from sprain, Colles' fracture and fractures of the scaphoid. The author says: "if" the *x*-rays are used lateral and antero-posterior views should be taken. It would be better to advise that in every case in which this midcarpal lesion is even suspected good *x*-ray plates be obtained as an indispensable aid to accurate diagnosis. Simple reduction, operative reduction, and excision of one or more bones, represent the possible methods of treatment.

The rare injuries of radiating fracture of the acetabulum, fracture of the floor of the acetabulum, and backward dislocation of the lower jaw, are briefly but sufficiently described, the former in a new subsection, the latter in a paragraph.

The book remains, as always, the most complete, conscientious, and satisfactory treatise on fractures and dislocations that has yet been written. For the teacher or for the experienced practitioner it leaves nothing to be desired. For the student a "synopsis" dealing almost exclusively with symptomatology, diagnosis, prognosis and treatment, could not fail to be useful. We have often thought that the author would do well to have such a compendium prepared, and believe it would meet a genuine want in American surgical literature.

Here and there throughout the book we miss mention of methods and appliances that have come into vogue of late years, but it is fair to say that in our opinion their absence does not detract from the practical usefulness of the work, and that, doubtless, is also the opinion of the author. J. W. W.

DISEASES OF INFANTS AND CHILDREN. By HENRY DWIGHT CHAPIN, A.M., M.D., Professor of Diseases of Children in the New York Post-Graduate Medical School and Hospital; and GODFREY ROGER PISEK, M.D., Professor of Diseases of Children in the University of Vermont; Adjunct Professor of Diseases of Children in the New York Post-Graduate Medical School and Hospital. Pp. 609; 179 illustrations, and 11 colored plates. New York: William Wood & Co., 1909.

IN order to offer intelligent criticism of a book it is essential not to lose sight of the purpose for which it was written. The authors of the present volume state in the preface that their object has been to contribute a book which should stand midway between a mere compendium and an exhaustive treatise on pediatrics. It would, therefore, be unfair to judge this book in comparison with some of the more elaborate works on diseases of children. However, from the standpoint of a text-book well adapted to the needs of the medical student it must be conceded that the authors have successfully accomplished their purpose.

One is impressed by the wide scope of the work: not only are the usual medical conditions dealt with, but the commoner surgical diseases of children, as well as those of the skin and organs of special sense, are also taken up. As a result of such multiplicity many of the descriptions are of necessity almost too brief. This conciseness is especially noticeable in the pathological descriptions, which are frequently inadequate or entirely wanting. The chief stress is laid upon symptomatology and diagnosis. That the book is thoroughly up-to-date is evidenced by the fact that procedures of such recent development as the various tuberculin reactions, the Wassermann reaction, opsonins, and vaccine therapy are fully described in the chapters on clinical examination and therapeutics. It is also gratifying to note that wherever treatment is discussed drugs are accorded their proper subordinate position, and emphasis is laid upon the vastly more important role of suitable hygienic and dietetic measures in the management of disease in children.

The feeding of infants is taken up in great detail. Instead, however, of plunging the student into the intricacies of this subject, the more rational plan is followed of first pointing out the anatomical and physiological peculiarities of the infantile digestive organs and then explaining the fundamental biological principles upon which rests the science of infant feeding. Of the various means of adapting cow's milk the authors look with most favor upon the so-called top-milk method, which, because of its simplicity, accuracy, and ecomony, is gaining in popularity among pediatrists.

No other group of diseases is taken up so fully as are the acute infections. The section on the acute exanthemas is worthy of note; the eruptions are described with unusual clearness, especial

care and attention being given to their differential diagnosis. Although acute anterior poliomyelitis is, with good reason, classified as one of the acute infections, rather than as a nervous disease; curiously enough, pneumonia, preëminently an acute infection, is found under diseases of the lung. Moreover, there would seem to be little to justify grouping the chronic arthritides, as the authors have done, among the acute infectious diseases. Their classification of chronic arthritis is unsatisfactory. For example, under the vague term "rheumatoids" they have included villous arthritis, arthritis deformans, tuberculous arthritis, and Still's disease. In view of the present state of our knowledge, they have, perhaps with wisdom, chosen to ignore the perplexing question of the etiology of the first two forms.

Although for the most part diseases of the heart are adequately covered, such characteristic signs as the pulse of mitral disease and the tapping apex beat and ringing valvular first sound found in mitral stenosis are surely of sufficient importance to deserve mention. Noteworthy omissions also occur under pericarditis. In describing pericarditis with effusion no mention is made of the shapes assumed by the dulness of a pericardial effusion, of Bamberger's posterior patch of dulness, or of the obliteration of the normal cardiohepatic angle. Furthermore, although of undoubted clinical importance and not infrequent occurrence, chronic adhesive pericarditis is entirely ignored.

The book is well printed, the illustrations are instructive, and there is a pleasing absence of typographical errors. Although the condensed and at times elementary style of the book may impair its value to the trained pediatrist, among students as well as among general practitioners it should enjoy deservedly a wide field of usefulness.

G. M. P.

THE PRACTICE OF MEDICINE. By JAMES TYSON, M.D., Professor of Medicine in the University of Pennsylvania, Philadelphia. Fifth edition; pp. 1438; 250 illustrations. Philadelphia: P. Blakiston's Son & Co., 1909.

IN the new recently issued edition of his *Practice of Medicine*, Dr. Tyson presents a careful and thorough revision of his well-known book. Much new matter has been incorporated; the sections on the infectious diseases, diseases of the blood, and diseases of the gastro-intestinal tract especially have been enlarged and improved. Reference has been made to the use of tuberculin in the treatment of tuberculosis; to tests for occult blood in the gastric contents and the feces; to the Cammidge reaction in diseases of the pancreas; to the opsonic index; and to the clinical uses of blood

cultures. The section on tetany and exophthalmic goitre has been largely rewritten, and to these Dr. Beebe has contributed a note on the use of his serum in Graves' disease. There are many other additions and minor alterations throughout the book, all of which, together with the retention of the excellent clinical descriptions and the suggestions for treatment of the previous editions, make the book deservedly one of the most popular of its kind. A. K.

THE MEDICAL COMPLICATIONS, ACCIDENTS, AND SEQUELS OF TYPHOID FEVER AND THE OTHER EXANTHEMAS. By HOBART AMORY HARE, M.D., B.Sc., Professor of Therapeutics in the Jefferson Medical College; and E. J. G. BEARDSLEY, M.D., L.R.C.P. (Lond.), Assistant Demonstrator of Physical Diagnosis and Clinical Medicine in the Jefferson Medical College. With a Special Chapter on the Mental Disturbances Following Typhoid Fever, by FRANCIS X. DERCUM, M.D., Professor of Mental and Nervous Diseases in the Jefferson Medical College, Philadelphia. Second edition; pp. 406; 28 illustrations. Philadelphia and New York: Lea & Febiger, 1909.

THIS volume is in part a revision and amplification of a volume on typhoid fever, issued about ten years ago; in part, also, it comprises a review of recently acquired knowledge of other exanthemas—variola, scarlatina, measles, varicella, and rubella. Three hundred pages are devoted to typhoid fever—to certain general considerations of the disease; to varieties of onset of the infection; to aberrant symptoms, states, or complications of the well-developed stage of the disease; to the complications of the period of convalescence; to conditions which resemble typhoid fever; to the duration of the disease; to immunity to second attacks; and to the mental complications. The literature has been exhaustively reviewed and the compilation is up-to-date; there is little, if anything, about the disease that has not received adequate mention and discussion, except treatment. Were the reviewer hypercritical, he would express regret that treatment also is not mentioned, but he is appreciative of the excellence of the presentation as it is. The chapters on variola, scarlatina, measles, varicella, and rubella are also good, although not so exhaustive as those devoted to typhoid fever. The book undoubtedly is a valuable monograph, and, dealing largely with typhoid fever, a disease widespread in its distribution, protean in its manifestation, and extremely variable in its complications and sequels, should be possessed and read by all physicians who have occasion to treat typhoid fever subjects. A. K.

THE RÖNTGEN RAYS IN PEDIATRICS. The Diagnosis of Diseases in Early Life by the Röntgen Method. By THOMAS MORGAN ROTCH, M.D., Professor of Pediatrics in Harvard University. Pp. 225; 303 illustrations. Philadelphia and London: J. B. Lippincott Company, 1910.

ONE of the essential objects of the author in compiling this treatise is to show in a convincing manner when and how the *x*-ray examination should be employed in connection with the diagnosis of those diseases, injuries, or abnormal conditions of developmental origin during early life in which method is applicable, and to emphasize the necessity of its employment as a means of completing or confirming clinical data otherwise obtained, in order that the most accurate diagnostic results may be derived. The author is one of the first among American clinicians to take the initial step in dealing with Röntgen diagnosis in a comprehensive manner from the purely clinical standpoint, and aside from any favorable or critical comment that might be made concerning his work as a book, his efforts in this one direction are most commendable. The book is essentially a treatise upon *x*-ray diagnosis, and does not touch upon apparatus, methods, or technique, except occasionally where some reference to this aspect of radiography may be imperative. As such it will no doubt be regarded in a different light by certain general groups among the medical profession. Taking as one group the undergraduates and the recent graduates, the author states that it is one of his main objects to reach this class in particular and to teach them the full importance of radiography, the extent of its useful application, and how it should be applied as an additional diagnostic method. To this group the book will likely appeal the most strongly and be of the most practical service. It is likely to appeal also, but in a somewhat different manner, to the young and rather inexperienced *x*-ray man, who may be able to find in it a substitute for some of the experience which he lacks. To the older physician or surgeon and to the Röntgenologist the book has little new information to offer, and can hardly be regarded by them as more than a useful book of reference.

The general arrangement of the subjects and of the text and illustrations is well adapted to the purpose of teaching the correct application of Röntgen diagnosis. In connection with each condition discussed, after a review of its characteristic clinical and pathological features, there follows a discussion of the radiographic features that are likely to be presented, how they are to be recognized, and how to interpret the appearances correctly. Each condition is suitably illustrated by typical radiographic examples which are direct reproductions from skiagrams.

A rather unique feature of the book is the discussion of an additional use for radiography during early life. The author suggests

a plan for utilizing the radiogram as a means of calculating anatomical and physiological development in connection with child labor problems and the grading of gymnastic and atheletic exercise and even education. H. K. P.

FUNCTIONAL DIAGNOSIS. By THOMAS G. ATKINSON, M.D., Associate Professor of Neurology and Physiology in the Chicago College of Medicine and Surgery, Chicago. Pp. 213. Chicago: Chicago Medical Book Co., 1909.

IT may well be questioned if the title of the book under review is not a misnomer, since one would be led to believe, as was the reviewer, that methods of determining altered function were under discussion. What the author has intended to do, however, is to correlate the symptoms and the anatomical lesions producing them in such a way that the diagnostician may be able "to reason back his symptoms to their functional premises, and to state his pathological condition in terms of physiology." Or, to express the thought in another way, the author "attempts the task of translating the normal functions of the body, through their various derangements, into terms of disease." The size of the book precludes any detail, and hence it is that such a statement, as "when any pulmonary disease is accompanied by pain on respiration it is due to an attendant bronchitis or pleurisy," creeps in. Taken all in all, the book seems more fitting to the undergraduate than for the use of the advanced diagnostician, since the latter would be scarcely content to accept some of the author's statements sine deliberatione. E. H. G.

OPHTHALMIC SURGERY: A TREATISE ON SURGICAL OPERATIONS PERTAINING TO THE EYE AND ITS APPENDAGES, WITH CHAPTERS ON PARA-OPERATIVE TECHNIQUE AND THE MANAGEMENT OF INSTRUMENTS. By CHARLES H. BEARD, M.D., Surgeon to the Illinois Charitable Eye and Ear Infirmary. Pp. 674; 309 illustrations. Philadelphia: P. Blakiston's Son & Co., 1910.

THIS work is a description of the various operations practised in the treatment of the surgical diseases of the different structures of the organ of vision and its adnexæ. It includes an account of the instruments employed, the preparation of the patient, and naturally embraces the methods of asepsis and antisepsis as regards instruments and field of operation. The author generally gives expression to his personal views and preferences when a number

of procedures to accomplish the same end are under discussion. These views are in the main judicious, even if somewhat dogmatically expressed. Few would probably dissent from the statement that the time has not yet arrived for the general employment of the Indian method of extraction in the capsule. A valuable part of the work is an account of the principal accidents the operator is liable to meet with and the best methods of preventing their occurrence and remedying their ill effects when they have occurred. The illustrations as a whole are very helpful in elucidating the text; the author somewhat apologetically states that they are "the fruits of his individual labor;" no apology is necessary, but he is to be congratulated upon his skill. Facility in this direction should be cultivated by every one ambitious to succeed in the delicate operations required in ophthalmic surgery as a training to the eye and hand. The work is smaller than Czermak's *Augenärztlichenoperationen*, and about twice as extensive as that of Grimsdale and Brewerton upon the same subject.

While we can say of this work, "It's all there and it's all true" (in the main), we confess to some slight feeling of disappointment; to describe a series of acts is one thing, but to give them that degree of clearness that the reader, as it were, seems to *see* what the writer wishes to convey is another thing; in this respect the work leaves something to be desired. Among other peculiarities of style we observe a frequent use of the expression to "make an operation," instead of to perform or do one—grammatically correct enough, but in the reviewer's opinion a halting form. All these, however, are minor faults, like specks upon the columns of the temple. The author and American ophthalmology are both to be congratulated upon the production and possession of this treatise upon the important subject of ophthalmic surgery. T. B. S.

STUDIES IN RABIES. Collected Writings of NATHANIEL GARLAND KEIRLE, A.M., M.D., D.Sc., Professor of Medical Jurisprudence and Emeritus Professor of Pathology in the College of Physicians and Surgeons; Director of the Pasteur Institute, Baltimore. With an introduction by WILLIAM H. WELCH, and a Biographical Sketch by HARRY FRIEDENWALD. Testimonial edition. Lord Baltimore Press, Baltimore, Md., 1909.

As a mark of esteem and admiration for Dr. Keirle these studies have been collected and published by his friends. The fourteen papers printed in this volume represent, besides contributions to various medical journals and to the *Twentieth Century Practice of Medicine*, dating from 1893 to the present day, several articles hitherto unpublished; and it is interesting to note in all these papers

the gradual development of our knowledge of rabies and the accumulation of those valuable statistics, which place the present method of treatment upon such a firm foundation. Dr. Keirle's work has been principally directed toward the practical side of the problem, and for this reason the papers upon "The Technique of the Pasteur Antirabic Treatment," "The Fallacy of the Rapid Diagnosis of Rabies, etc.," the statistical articles, and the practical notes on the treatment of those bitten by supposedly rabid animals will have a wide appeal. Perhaps the most valuable chapter in many respects are the two extensive discussions upon rabies, which comprise the major portion of the volume. In these papers Dr. Keirle's experience and careful observations are always apparent. The book cannot fail to be of use to one who wishes to familiarize himself with this important subject. W. T. L.

HANDBOOK OF DISEASES OF THE EAR FOR THE USE OF STUDENTS AND PRACTITIONERS. By RICHARD LAKE, F.R.C.S., Eng. Surgeon for Diseases of the Ear, etc., in the London School of Clinical Medicine. Third edition; pp. 248; 70 illustrations. New York: William Wood & Co., 1910.

THE third edition of this excellent little handbook will maintain the reputation of its predecessors, as a clear and concise exposition of the first principles of the practice of otology. The book should be of especial value to post-graduate students, or to general practitioners who desire to understand the treatment of the commoner pathological conditions of the ear. Its essential characteristic is its practicality. The author avoids the discussion of disputed points, and confines himself strictly to an exposition of the better known phases of the subject. F. R. P.

PATHOLOGISCHE ANATOMIE. Edited by L. ASCHOFF, M.D., of Freiburg, i. Br., Germany. Vol. i, pp. 636; 364 illustrations; vol. ii, pp. 815, 552 illustrations. Jena: Gustav Fischer, 1909.

The *Textbook of Pathological Anatomy* edited by Professor Aschoff is the composite work of a number of well known German teachers. In the first volume, E. Albrecht, of Frankfurt, discusses the internal causes of disease; M. Askanazy, of Geneva, the external causes of diseases; E. Schwalbe, of Rostick, malformations; E. Giercke, of Karlsruke, disorders of metabolism and of internal secretion; A. Dietrich, of Charlottenburg, disturbances of circulation; R. Kretz, of Prague, immunity; O. Lubarsch, of Düsseldorf, in-

flammation; and M. Borst, of Wurzburg, organization, regeneration and tumor formation. In the second volume the editor discusses diseases of the heart and pericardium, of the urinary apparatus, and of the female genitalia; C. Benda, of Berlin, diseases of the bloodvessels; H. Schridde, of Freiburg, diseases of the blood-forming organs and the thymus; O. Naegeli, of Zürich, diseases of the blood; M. B. Schmidt, of Zürich, diseases of the locomotive apparatus; H. Beitzke, of Berlin, diseases of the respiratory organs; B. Fischer, of Frankfurt, diseases of the digestive organs; C. Sternberg, of Brünn, diseases of the liver and the biliary passages; M. Simmonds, of Hamburg, diseases of the male genitalia; O. Ernst, of Heidelberg, diseases of the nervous system; and L. Jores, of Cologne, diseases of the skin. The work is a valuable addition to contemporary medical literature splendidly illustrated, and since it is representative of the present German school of pathology it may be much commended.

A. K.

GENETIC PSYCHOLOGY. By EDWIN A. KIRKPATRICK, B.S., M.PH. Pp. 373. Macmillan: New York, 1909.

IN this work the author has attempted to correlate all life phenomena, from those of plant growth to the most complex processes of consciousness of the human mind, applying the theory of evolution to psychology. "Not until the facts and theories of all the sciences concerned with life phenomena have been studied to determine their common and their differentiating characteristics, can we have a psychology that is a fitting apex to these sciences." Acting upon this principle, the subject is taken up with a consideration of the structural basis of behavior and types of animal behavior, tracing the different reactions in the various organisms from the purely physiological processes in the lowest to the complex behavior characteristic of the higher species of animals and the abstract concepts developed only in the brain of man. Aside from the manner of presentation, which is undoubtedly favorable to a broad conception of the subject, this book does not differ materially from others elemental works on psychology.

S. D. I.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

The Relation of Typhus Fever to Rocky Mountain Spotted Fever.—RICKETTS and WILDER (*Arch. Int. Med.*, 1910, v, 361) have made a careful study of the clinical, anatomical, and immunological relationships between Rocky Mountain spotted fever and the typhus fever (tabardillo) of Mexico. In both the condition is that of a systematic blood infection and presumably lymph infection without the critical involvement of particular organs. Clinically the eruptions are very similar, differing but slightly in time of appearance and distribution. Gangrene occurs in both diseases. The spleen is habitually enlarged in spotted fever, not in typhus. The fever in typhus is more abrupt in onset and termination and the course shorter. They have the feature of insect transmission in common, the body louse in the case of typhus and ticks in spotted fever. It is probable that neither disease is contagious. A striking difference, however, is found in the susceptibility of animals to the two diseases. All attempts to infect laboratory animals with the blood of typhus fever patients have failed. Spotted fever can be transmitted to the guinea-pig invariably by the subcutaneous or intraperitoneal injection of virulent blood. This evidence shows definitely that the two diseases are not identical. In addition it was demonstrated that an attack of typhus fever in the monkey does not render him immune to spotted fever, although it does protect him against infection from a second injection of virulent typhus virus. The serum of typhus convalescents exerts no more protective effect against spotted fever than does normal serum. Such serums also show little or no more agglutinating effect for the bacilli which appear to be associated with spotted fever than do normal serums. The authors conclude from this evidence that the diseases are not identical and the organisms are not closely related biologically.

The Pressor Bases of the Urine.—BAIN (*Lancet*, 1910, i, 1190), working in Halliburton's laboratory, found the so-called pressor bases were most readily obtained by shaking the urine with blood charcoal (Fleming's) and extracting with ether and alcohol. The base in the ethereal extract is probably iso-amylamine, a derivative of leucine; that in the alcohol is p-hydroxyphenylethylamine from tyrosine. These extracts, from normal urines, will produce a rise in blood pressure when injected intravenously in cats. The exception is in normal urines from growing children in which they seem to be constantly in minimal amounts. The pathological interest lies in the fact that these pressor bases are very much diminished or entirely absent from the urines of individuals with high blood pressures. Bain feels that they are probably retained in the body and play an important part in the production of the increased blood pressure. Although he locates the source of these substances in the intestinal putrefactive processes, still he was unable to influence their presence by change of diet, lactobacilline milk, or, such intestinal antiseptics as calomel and salol.

The White Line of Adrenal Insufficiency.—In 1904 Sergent described a new sign of adrenal insufficiency due to arterial hypotension. It is the "white line" which results from the ordinary dermatographia test. LAUTIER and GREGOIRE (*Soc. de biol.*, 1910, lxvii, 690) found the white line present in 145 out of 228 cases; 65 of these had hypotension and 80 a normal or hypertension. The 83 cases which did not give the test included 30 with hypotension and 53 with normal or hypertension. The 80 cases with the white line without hypotension and 30 with hypotension without the white line make a total of 110, or one-half of the 228 cases tested which do not conform to the rule. They conclude that the white line cannot therefore constitute a sign of either adrenal insufficiency or hypotension.

Vasophylaxis.—ATKINSON and FITZPATRICK (*Proc. Soc. Exper. Biol. and Med.*, 1910, vii, 77) have found that dogs sensitized by a subcutaneous injection of 5 c.c. of tuberculin suffer a marked reduction in arterial blood pressure when serum from tuberculous rabbits is injected intravenously at an interval of twelve to eighteen hours after the sensitization. The reaction is specific as far as tested. Glanders serum, typhoid, antityphoid, antistreptococcus, normal rabbit, and normal horse sera have all been tested. The reaction is probably one of the many phases of sensitization or increased susceptibility, following the action of toxic substances. The reaction, it is suggested, if found sufficiently specific, may be used as another method for the diagnosis of tuberculosis. The authors tentatively name the phenomenon vasophylaxis.

Further Clinical Observations on the Sphenopalatine Ganglion.—A year ago SLUDER pointed out a symptom complex whose starting point was referred to the sphenopalatine ganglion. Its most frequent neuralgic manifestation is pain beginning at the root of the nose, taking in the upper jaw and sometimes the lower jaw, extending backward under the zygoma and frequently including the ear, marked at the mastoid

but most intense at a point 5 cm. posterior to it. It reaches back over the occiput, descends into the neck, and even into the shoulder blade, shoulder, axilla, arm, forearm, and hand. The pterygomaxillary fossa in which the ganglion lies reacts like an accessory nasal sinus, and the neuralgia has arisen secondarily to inflammatory processes in the nasal sinuses. He has been able to stop the pain by applying cocaine to the nasal mucous membrane at the site of the sphenopalatine foramen, beneath which the ganglion lies. Sluder has further observed certain motor, sensory, and gustatory signs of this affection (*New York Med. Jour.*, 1910, xci, 850). A large proportion of the cases show an asymmetry of the arches of the soft palate with a slight deviation of the median ridge toward the well side. The arch on the affected side is the higher, and the uvula frequently inclines to the well side. The sensation is distinctly dulled on the affected side of the uvula as far forward as its junction with the hard palate. These signs he has observed to appear and disappear with the attacks of neuralgia. Fifty normal cases showed no asymmetry or difference in sensation on the two sides. In ten neuralgic cases tested, the sense of taste was more acute on the well side. It was constantly less acute on the side of the higher arch, or the side from which the median ridge was deflected. This remained slightly diminished after the attacks of pain had subsided.

The Elimination of Bacteria from the Blood through the Wall of the Intestine.—HESS pointed out a year ago that bacteria injected into the blood stream in rabbits could be recovered by culture from the contents of the small intestine. He has continued the work by investigating the path by which these bacteria enter the alimentary tract (*Proc. Soc. Exper. Biol. and Med.*, 1910, vii, 82). He employed Bacillus prodigiosus and rabbits in his experiments. Four routes seemed possible: (1) The bacteria may enter the lung and then gain access to the gastro-intestinal tract; (2) they may enter the intestine through the common bile duct or through the (3) pancreatic duct; or (4) they may traverse the wall of the intestine. Ligation of the pylorus, the common bile duct, and of the pancreatic duct had no influence upon the finding of these bacilli in two to three hours after injection into the ear vein. Division of the intestine into segments resulted in showing no difference at all in the permeability of the various segments of the intestinal wall. The bacteria were excreted by the bile and also were found in the urine, but they apparently traversed with ease the walls of the small intestine in a manner which, however, has not yet been demonstrated by Hess.

Experimental Hypophysectomy.—CROWE, CUSHING, and HOMANS (*Johns Hopkins Hosp. Bull.*, 1910, xxi, 127) have continued their reports of the study of the hypophysis and its removal. The total removal results in a state of apituitarism which leads inevitably to the death of the animal. This occurs with a peculiar and characteristic train of symptoms (cachexia hypophyseopriva). The animals become lethargic. The body temperature falls to approximately the room temperature. The gait becomes awkward and unsteady, especially in the hind legs. The blood pressure falls and the pulse becomes feeble, irregular, and slow. Tremors and spasmodic muscular twitch-

ings develop; finally, complete anesthesia, then deep coma ensue, the transition to death being almost imperceptible. That this is not due to surgical trauma is evidenced by the facts (1) that the same operative manipulations leaving the hypophysis in place and omitting the single step of removal leads to no symptoms whatsoever, and (2) that incomplete removals produce no immediate disturbances. These same symptoms follow the removal of the entire anterior lobe alone, even though the posterior lobe remains in place. On the other hand, removal of the posterior lobe leads to none of the manifestations of cachexia hypophyseopriva. Definite constitutional disturbances regarded by the authors as manifestations of hypopituitarism have been observed after partial removals (anterior lobe) in a number of animals kept under observation for long periods of time. The most striking feature is a state of adiposity accompanied by a secondary hypoplasia of the organs of generation in adults or by a persistence of sexual infantilism in case the primary hypophyseal deficiency antedates adolescence. Polyuria, glycosuria, alterations in skin and appendages (such as œdema and hypotrichosis), the tendency to a subnormal body temperature, and psychic disturbances are more or less frequent accompaniments—all of them symptoms which occasionally occur with states of adiposity and of sexual infantilism in man, in company with certain pituitary body tumors—states, therefore, which presumably are due to hypophyseal (anterior lobe) deficiency. Animals, in states of hypopituitarism, appear to have a lowered resistance to infection, exposure, or disease. Boiled anterior lobe emulsions appear to elicit a characteristic (anaphylactic?) febrile response when injected subcutaneously in states of experimental hypopituitarism.

The Function of the Hypophysis.—Franchini (*Berl. klin. Woch.*, 1910, xlvii, 613, 670, 719), as the result of extensive experimental investigations, has reached the following conclusions as to the functions of the hypophysis: (1) Administration of the hypophysis (obtained from the ox and the horse) leads to severe changes in metabolism, especially of the inorganic salts, manifested by a marked deficit in calcium, magnesium, and, to a less degree, phosphorus. (2) The hypophyseal extract produces glycosuria in rabbits only exceptionally. (3) Aside from its toxic action on rabbits and guinea-pigs, hypophyseal extract exerts a special influence on the intestinal canal, leading to ulceration and hemorrhage, probably due in part to vascular change, in part to lesion of the trophic nerves. (4) The extract is most toxic when administered intravenously, less so when given subcutaneously or by mouth; digestion of the extract in vitro lessens its toxicity somewhat. (5) The anterior lobe, freed from its epithelial covering, causes only mild symptoms in rabbits, but if the epithelial layer of the posterior lobe be included, death of the animal may ensue. The isolated posterior lobe exerts its effect particularly upon the metabolism and on the vessels and organs of the abdomen. (6) The posterior lobe contains a substance which produces active mydriasis of the frog's eye, but does not give the other adrenalin reactions. This body is absent from the anterior lobe, present in the epithelial layer, but to a less extent than in the posterior lobe. The serum of animals which have received extract of the posterior lobe causes mydriasis; this is seldom the case when anterior lobe extract is used.

The Detection of Levulose in the Urine.—JOLLES (*Münch. med. Woch.*, 1910, lvii, 353) proposes a slight modification of the Ihl-Pachmann reaction for levulose, by which it may be applied to the detection of levulose in the urine. By experiment the author has found that the Ihl-Pachmann test is capable of demonstrating levulose in a dilution of 0.005 per cent. If the urine to be tested contains no dextrose or dextrose up to 2.5 per cent., it is diluted ten times with water (for a 0.25 per cent. solution of dextrose may give a faint positive test for levulose, but only after boiling seventy to ninety seconds). To 1 c.c. of the diluted urine one adds 8 to 10 drops of a 20 per cent. alcoholic solution of diphenylamin and about 1 c.c. of concentrated HCl. The mixture is boiled about sixty seconds. If no levulose is present, the solution remains colorless; if even 0.05 per cent. of levulose is present (in the undiluted urine), a characteristic blue color appears after boiling about forty seconds. Where dextrose amounts to between 2.5 per cent. and 5 per cent. in the urine, the latter must be diluted twenty times before applying the test, which is now capable of revealing the presence of 0.1 per cent. of levulose or more.

The Meiostagmin Reaction in Typhoid Fever, Tuberculosis, Echinococcus Disease, and Ankylostomiasis.—IZAR (*Münch. med. Woch.*, 1910, lvii, 842) reports further observations on the diagnostic value of the meiostagmin reaction, which tend to show that it is specific and of value in clinical medicine. In 40 cases of pulmonary tuberculosis, in which the diagnosis was confirmed by the cutaneous test or the finding of bacilli, or, in most cases, by both, 39 gave a positive meiostagmin reaction. Sera from 74 non-tuberculous patients tested with tuberculous antigen reacted negatively. The tuberculous sera were negative when tested with the antigens of typhoid, lues, tumor (malignant?), ankylostoma and echinococcus. In like manner, the meiostagmin reaction was positive in 9 cases of typhoid fever. Sera from 6 patients suffering with ankylostomiasis gave positive reactions only with ankylostoma antigen. A negative reaction obtained with the serum of a patient infected with Strongyloides stercoralis when tested against ankylostomum antigen, was striking. Seven cows and three swine having echinococcus cysts showed a positive reaction with echinococcus antigen. These results agree with those recently reported, and make it highly probable that the meiostagmin reaction will prove to be of great aid in diagnosis.

The Relation of Diacetic Acid to B-Oxybutyric Acid.—BLUM (*Münch. med. Woch.*, 1910, lvii, 683) reports observations made on man and dogs which are of great interest in connection with acidosis and the metabolism of the fatty acids. In normal dogs he has introduced various substances subcutaneously in large quantities, and in normal men and mild diabetics has given them per os. His studies have resulted in the following conclusions: (1) β-oxybutyric acid may be derived from diacetic acid both in dogs and man. (2) In the metabolism of the fatty acids, such as butyric, caproic, and isovalerianic, diacetic acid arises. (3) β-oxybutyric acid is not converted into diacetic acid in the normal animal. (4) The change of β-oxybutyric acid into diacetic acid is probably the result of disease of

the liver cells; the glycogen content of the liver does not explain the change. (5) Crotonic acid, an unsaturated fatty acid, is converted into β-oxybutyric acid by the addition of water. (6) The surviving liver of normal dogs may reduce diacetic acid to β-oxybutyric acid. (7) β-oxybutyric acid is much less toxic than many other fatty acids. This fact makes it difficult to accept the theory (von Noorden, Lepine) that β-oxybutyric acid is the specific poison causing coma diabeticum.

The Etiology of Hodgkin's Disease and Lymphatic Leukemia.—FRÄNKEL and MUCH (*Münch. med. Woch.*, 1910, lvii, 685) have applied the antiformin method to the study of organs, especially glands and spleen, of patients having Hodgkin's disease and lymphatic leukemia. In nine out of ten cases of Hodgkin's disease they have found a granular bacillus which stains by Gram's method, but not by Ziehl's, resembling the tubercle bacillus morphologically and, like it, antiformin-fast. This bacillus was associated with the tubercle bacillus only exceptionally, but it appears to be closely related to the latter. As cultural experiments were negative, a more intimate study of the organism was impossible. Likewise, in seven cases of lymphatic leukemia, the antiformin method revealed a rather thick, granular rod, Gram-positive but Ziehl negative, present in the lymph glands and spleen. They believe these organisms, apparently closely related, will prove to be of etiological significance. Similar studies of tissues of myelogenous leukemia, mediastinal tumor, and carcinomatous glands have shown no organisms.

A Comparative Study of Wassermann Reaction, Lymphocytosis, and Globulin Test in Diseases of the Nervous System.—WOLFF (*Deut. med. Woch.*, 1910, xxxvi, 748) has made a study of the comparative frequency of the Wassermann reaction in the blood and cerebrospinal fluid, and of lymphocytosis and the globulin test in the cerebrospinal fluid, in 100 cases of disease of the nervous system, including 40 cases of tabes dorsalis, 30 of dementia paralytica, 9 of cerebrospinal lues, 5 of apoplexy, 4 of alcoholic neuritis, 6 of neurasthenia, and 6 of epilepsy. He finds that of the three reactions the globulin test gives the most constant results; it is valuable in that it is negative in those cases of syphilis in which no para- or metasyphilitic affections are present. Lymphacytosis and globulin reactions are valuable also in differentiating between organic disease of the central nervous system and peripheral or functional nervous disorders. Complement fixation in the cerebrospinal fluid was much less constant in its occurrence than were lymphocytosis and the globulin reaction.

Rheumatic Parotitis.—COURTOIS-SUFFIT and BEAUFUME (*Bull. et mém. de la Soc. méd. des hôp. de Paris*, 1910, xxvii, 3 s., 194) call attention to a complication of acute rheumatic fever which has never been described before—inflammation of the parotid gland. From the three cases reported by them, the inflammation is usually unilateral, and may appear either when the joint symptoms are at their maximum or at any time up to the beginning of convalescence. The process is of short duration and may clear up completely in from thirty-six hours to five days. The temperature may rise to 40° C. In two

instances the arthritis and parotitis were present simultaneously, while in the third case the arthritis ceased when the parotitis began and developed again on the disappearance of the parotitis. The authors believe that the cause of the parotitis is the same as the etiological factor of the arthritis, and they therefore, used sodium salicylate as treatment.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSOCIATE IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE PHILADELPHIA GENERAL HOSPITAL, AND ASSISTANT SURGEON TO THE UNIVERSITY HOSPITAL.

Bony Union of the Radial Diaphysis Obtained with the Use of an Immovable Metallic Ring.—MAUCLAIRE (*Archiv. gén. de Chir.*, 1910, vi, 140) calls attention to the difficulties often experienced in obtaining satisfactory union after a fracture of the radial diaphysis, whether the radius alone or the radius and ulna are fractured. Sometimes the four fragments are fused solidly together, more frequently the upper fragment of the radius is drawn to the ulna by the pronator teres and the lower by the pronator quadratus. He refers to a case in which from such a cause the patient was incapacitated 75 per cent. Wire suture of the bones leads frequently to a rarefaction of bone and interferes with union, even when the periosteum is carefully saved. He obtained good results from the use of an immovable metallic ring. This consists first, of an ensheathing plate, 4 cm. long, and underneath the upper part is a smaller plate furnished with four points which can be pressed by means of a screwdriver down on the fragments, which are thus approximated. By means of a second instrument the ring can be withdrawn. The wound is left open and packed with gauze, and the forearm is encased in a plaster bandage. In some cases non-operating treatment does very well, especially if there is little tendency to deviation of the fragments. When there is a persistent deviation of the fragments, operation becomes necessary. The metallic ring produces little traumatism of the bone, since it is not penetrated. The fragments are coapted by simple pressure.

Extension Treatment in Fractures of the Leg.—KNOKE (*Zntrlbl. f. Chir.*, 1910, xxxvii, 497) says that after trying for a long time the Bardenheuer method of extension without satisfactory results, and later Rucker's modification, he has come to the employment of a method of his own, and finds it much more satisfactory. After careful padding of the foot, especially the dorsum to above the malleoli, a

plaster cast was applied with the foot in an easy position in dorsal flexion and supination. At each side a strip of canvas was inserted in the plaster for the support of the extension weight later. Before applying the plaster bandages, the midline on the extensor and flexor sides was marked by a strip of adhesive or something similar, in order that, before hardening, the plaster could be cut along these two lines and the cast divided into two lateral halves. These could be easily removed and just as easily reapplied. After its division it is held in place by a few turns of a bandage, and after it has hardened it becomes a plaster shoe. By employing sufficient padding in the first application of the plaster, the shoe still fits the foot when swollen. The results obtained from the use of this method have been very good. The deformity could be corrected and good functional results obtained. The following advantages are claimed for the method: It is very simple, cheap and frequently applicable. It overcomes the tendency to pointed toe deformity and flat foot, and immediately after the application of the shoe the amount of weight necessary to overcome the deformity can be attached, as it cannot be done by any other method.

Grossich's Tincture of Iodine Method of Disinfecting the Skin.—Hesse (*Zntrlbl. f. Chir.*, 1910, xxxvii, 529) says that this method of disinfecting the field of operation is being employed by an increasing number of surgeons, and the large number of publications on the subject establish the excellence of the method. Some report that, in consequence of the employment of the official tincture of iodine, they had some trouble from iodine eczema. Grossich did not advise the use of the pure tincture, but of a 10 to 12 per cent. solution with alcohol, which was painted on the skin. The effective material is without doubt the iodine. Hesse has been employing a 20 per cent. solution with alcohol. He does not doubt, however, that the 10 to 12 per cent. solution is sufficient, so that one can choose any strength from 10 to 20 per cent. Hesse has not seen a single case of iodine eczema with a 20 per cent. solution, not even in the smallest children. If the pure official tincture is employed in the first preparation of the skin and then at each change of the dressing, many cases of iodine eczema must occur, so that in time this excellent method will be brought into disrepute. Grossich recommends that in emergency operations dry shaving be done, since the employment of water especially in a soapy solution, shortly before the operation, affects unfavorably the iodine disinfection.

A Case of Perforation of the Heart from a Gunshot Wound, without Perforation of the Pericardium, together with a Contribution Concerning Wounds of the Right Auricle.—Luxembourg (*Deut. Ztschr. f. Chir.*, 1910, civ, 254) reports the case of a young man who a short time before his admission to the hospital had shot himself twice, the bullets entering the fourth and fifth right intercostal spaces close to the edge of the sternum. Three hours after admission he was operated on. The greater part of the sternum was resected. The anterior mediastinum was extensively extravasated with blood. Small portions of the third to the fifth ribs on the two sides were removed. A small opening was found in the left pleura through which air passed in inspiration

and expiration. By careful probing and dissection along the track of the bullet the surface of the pericardium was exposed. No opening could be found in it anywhere, but the first bullet was seen lying on the pericardium, and was extracted. The second was found two fingers' breadth higher alongside the superior cava, and was also removed without special difficulty. Because of the absence of any opening in the pericardium and scarcely any change in either bullet, the pericardium was not opened and the wound was closed without drainage. About ten hours later the patient died. The autopsy showed that the pericardium had not been wounded, but was tensely filled with blood, about 300 c.c. being removed. In the right auricle was found a lacerated, channelled wound, about 3 cm. long and about 1 cm. from the superior cava. It terminated in a small lentil-sized opening in the auricle. The number of similar cases in the literature is small, and in them the wounds of the heart are, usually, first detected on the autopsy table. Luxembourg collected 11 cases; 4 more cases are added in which a traumatic rupture of the heart occurred from gunshot wounds which did not reach the region of the pericardium. The force of the bullet in his case had so diminished on reaching the pericardium that it could not penetrate it, but was strong enough to produce a wound in the more delicate and easily lacerated auricular wall. On the basis of the fatal termination in this case, Luxembourg recommends that in every wound of the anterior mediastinum with an intact pericardium, especially when there is a suspicion of a wound of the heart, the exposed pericardium should be punctured to determine whether it contains blood or not from a heart wound. Rehn advises that an incision be made. Wounds of the auricle have been operated on several times in recent years. They probably heal spontaneously at times. Wilms' method of handling these wounds seems to be the best. In his case the wound in the left auricle could not be made accessible for the introduction of sutures into the beating heart. The auricle was drawn forward, and its posterior half, including the small wound, was ligated and the bleeding thus controlled. For gunshot wounds of the auricle, because of the gaping and laceration of the edges and the delicate and fragile muscle tissue, this method of closure is especially adapted.

Total Extirpation of the Bladder for Carcinoma.—PETROW (*Deut. Ztschr. f. Chir.*, 1910, civ, 365) removed the whole bladder for carcinoma in 2 cases and collected 62 cases from the literature. The mortality in these 64 cases is about 50 per cent., and is about the same as in other statistics collected during the past ten years. The first of Petrow's cases had had a papilloma removed from the bladder a year before. He then has a recurrence and was in a very poor condition. A laparotomy was performed, the two ureters were transplanted into the pelvic colon, and a drainage tube left in the rectum. Two weeks later the total excision of the bladder was performed by a combined pararectal and suprasymphyseal operation. The course afterward was favorable throughout, and in six weeks after operation the wound was completely healed. Nine months after operation the patient was in good condition. Rectoscopy showed a normal mucus membrane and clear urine. In the second case death followed thirty-six

hours after the transplantation of the ureters into the pelvic colon. Total extirpation of the bladder is a severe operation, but so is the condition in connection with which the question of operation arises. It is indicated in advanced carcinoma of the bladder, excision of which is insufficient and the opportunity for immediate suture slight. If the kidneys are still in good condition, a favorable result may be expected. If they are already severely diseased, as in Petrow's second case, any major operation will be very dangerous on account of the probable anuria. The operation should be done in two stages, the first, the transplantation of the ureters, being followed in one and one-half to two weeks by the second, the removal of the bladder. The transplantation of the ureters should be made into the colon, the laparotomy necessary for it permitting an exploration of the degree of extension of the tumor beyond the bladder and the determination of the chances of removing it.

Multiple Calculi in the Ureter of a Child Six Years Old.—EYNARD and RAFIN (*Ann. d. mal. d. org.-gen. u-in.*, 1910, i, 673) made an attempt at extraction of the calculi by the transvesical route, but failed. After the bladder had been opened and the ureteral meatus dilated, a forceps was introduced into the ureter. The sensation of a foreign body was distinctly felt by the operator, but the stones could not be seized. Later an incision was made external to the border of the right rectus muscle and parallel with the groin. When the preperitoneal tissue was exposed the upper edge of the wound was strongly retracted upward. The search for the ureter gave some trouble. It was not found in the pelvic cavity nor where it crosses the iliac vessels, but was finally found anteriorly, slightly adherent to the peritoneum and dragged upon by the retractor. It was as thick as the thumb and looked somewhat like an intestine. After emptying it partially by a puncture, an incision 2 to 3 cm. long was made in it. The finger was introduced and an exploration made up to the bladder. The *x*-rays had shown shadows of 5 calculi. Only one could be found now, and this was removed by a forceps. Because of the size of the ureter it was thought that the stones had passed to the lumbar region. The upper part of the body was elevated but the stones did not pass into the pelvis. The finger could be passed in the ureter to the lumbar region but did not detect a stone. The incision in the abdominal wall was then extended to the lumbar region and the kidney exposed. When the finger was introduced into the renal pelvis the calculi were easily recognized and removed. A good result followed.

Transplantation after Resection in the Long Bones.—BITTNER (*Zentlbl. für Chir.*, 1910, xxxvii, 571) resected the lower third of the tibia for a myelogenous sarcoma. Almost the whole of the diaphysis was exposed by an incision and the tumor removed by the resection. The lower epiphyseal cartilage with a narrow border of periosteum remained. After freeing the inner side of the tibia of the soft structures, a hole was made from before backward by a drill, just internal to the tubercle of the tibia. By means of a Gigli saw and a chisel almost the inner half of the tibia from the tubercle down to the site of resection was removed. This piece of bone was turned to an angle of 180 degrees, so that its upper broad end presented below where it was fixed to the lower epiphys-

eal cartilage by a few silk sutures. The opposite end was fastened to the lower end of the tibia with a metallic suture. This brought the cancellous, upper end of the tibial graft against the lower epiphyseal cartilage and left the other end in contact with bone histologically similar. The remaining wound cavity was then filled with Mosetig's iodoform-lead. A drainage opening was made below and posteriorly, and the limb was surrounded with a plaster cast reaching above the knee. On the seventeenth day the sutures and the drain were removed, but the plaster cast was replaced and the child permitted to walk around in about six weeks. There remained a fistula at the site of the drainage from which, at first iodoform-lead and later, sequestra escaped, a sequestrotomy later becoming necessary. Consolidation of the graft took place, recurrence had not occurred at the time of the report and the function of the limb was good.

Intravenous Ether Narcosis.—PIKIN (*Zntrlbl. für Chir.*, 1910, xxxvi 673) reports his results in 16 cases by this form of narcosis, which was given by the Burckhardt method. Unconsciousness in all occurred with relative rapidity. It was uniform and simulated normal sleep. The stage of excitement was indicated only by increased frequency of the pulse. A few patients were given a preliminary hypodermic of morphine. Some complained of burning in the arm when the first portion of the infusion was introduced, but only for a half to one minute. In 2 cases there was some retching which disappeared as more ether was introduced. There was neither asphyxia nor rales during the narcosis and the pulse was of good quality. The postoperative course was even better. There was no bronchitis, pneumonia, or abnormality of the urine. In two laparotomies for severe gonorrhœal peritonitis, there was a complete absence of any sinking of the blood pressure, which is not rare with inhalation narcosis. The only fatal case was that of a sixty-two-year-old woman, poorly nourished and anemic, with marked arteriosclerosis. She had a diffuse epithelioma of the cheek and angle of the mouth and involvement of the submaxillary lymph nodes. An hour before operation she was given a hypodermic of morphine. Four minutes after the beginning of the introduction of the ether solution, in which time 300 c. c. were given, the pulse suddenly dropped to 40 per minute, and the face became pale. Although the infusion was stopped, the pulse could not be counted and the breathing ceased. Immediately, artificial respiration was instituted and the heart massaged through an abdominal incision, but without avail. Pikin regards this as an unsuitable case for the method, and thinks that the morphine aided in producing a fatal termination. While the method has many advantages over inhalation narcosis, especially in operations in acute anemia, for peritonitis, and operations about the face and neck, he agrees with Kütner that it is not particularly free of danger, which comes particularly from the occurrence of emboli. In one of his cases there occurred a thrombus in the cannula, on account of fractional infusion, but fortunately no trouble developed from it.

A Simple Method of Performing Temporary Laminectomy.—HOFMAN (*Zntrlbl. f. Chir.*, 1910, xxxvii, 706) says that the indications for laminectomy have been increased considerably by the new operation of

excising the roots of the spinal nerves. His method of performing the operation is as follows: An incision is made over the spinal processes to the desired extent. The muscles are separated from both sides of the processes to the laminæ, which are exposed to the transverse processes. The hemorrhage is controlled by packing, and the laminæ on both sides are divided by a sharp flat chisel placed as horizontally as possible. This required only a few blows of the mallet for each arch. The interspinous ligament is then divided transversely above or below and the nearest loose spinous process is seized with suitable forceps. The osteoplastic flap consisting of periosteum, bone, and ligaments is thus lifted after any still binding structures are divided. As free an exposure as is necessary can be obtained. The dura is then opened by a longitudinal incision and the desired roots excised. The dura is closed by a continuous suture, the muscles sutured together, and then the fascia over the spinous processes and the skin. Only a half hour was required for the operation.

The Treatment of the Complications of Round Ulcers of the Stomach.—SPISCHARNY (*Archiv f. klin. Chir.*, 1910, xcii, 172) reports the results in 110 cases treated in the surgical department of Moscow University. In 52 cases (47 per cent.), the ulcers were unhealed at the time of operation, and in 4 the ulcers had penetrated. All 4 died, 3 after operation. In 1 case after adhesion to the colon, a gastrocolic fistula had developed. Of the remaining 47, 2 were treated by resection, 1 was not operated on, and in 44 gastroenterostomy was performed. In 16 of these there were callous ulcers with pyloric stenosis. The immediate results were as follows: Death in 2, good results in 10, and improvement in 4. The permanent results in the 14 which lived were as follows: Good results in 7, improvement in 2, and death from unknown cause in 1. After gastroenterostomy there occurred no death from perforation of the ulcer. Consecutive hemorrhage developed five times, but was not severe enough to threaten the life of the patient. The immediate results in the 44 cases of unhealed ulcers treated by gastroenterostomy showed that good results were obtained in 33, improvement in 7, and death occurred in 4. In 5 cases the permanent results could not be learned, and one was operated on too recently to permit its inclusion with the others. In the remaining 34, there was a good result in 20, improvement in 6, formation of a peptic ulcer in 2, carcinomatous degeneration in 1, and death in 3. The objection is raised to excision of the ulcer alone or of the involved part of the stomach, that one cannot be certain that more ulcers do not exist. The immediate results of operation in 54 cases for cicatricial pyloric stenosis were good, 48 being cured, 5 improved, and 1 dying. The late results were about the same as in those cases in which the ulcers were unhealed at the time of operation. Spischarny concludes that in pyloric stenosis, from an unhealed ulcer or cicatricial stenosis, gastroenterostomy is indicated, because the immediate as well as the late results are so satisfactory. At times the normal lumen of the pylorus may be restored. The best method of gastroenterostomy is the posterior, with as short a loop of intestine as possible. The extent of intestine employed in the anastomosis is to be determined by the existence of dilatation or displacement of the stomach. The admixture of bile with the stomach

contents is usual after the anterior as after the posterior gastroenterostomy. It is evidently not dangerous, but rather an advantage. The gastric mucosa in ulcers and stenosis is considerably changed for some distance from the stenosed place.

THERAPEUTICS.

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.,

PROFESSOR OF APPLIED THERAPEUTICS IN THE COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY, NEW YORK.

The Treatment of Pseudoleukemic Glandular Disease with Arsacetin.—NAEGELI (*Therap. Monatsh.*, 1910, xxiv, 57) relates his results with arsacetin in the treatment of three cases of apparently typical pseudoleukemic glandular disease. He gave the remedy in doses of 0.05 gram three times a day. One very remarkable case had suffered from an irregular fever for a period of seven months, and had resisted all previous methods of treatment. After the internal use of arsacetin for two days the fever disappeared. During the following two months the patient gained thirty-one pounds in weight and he was apparently cured.

The Ambulant Treatment of Epilepsy with Sabromin.—FROEHLICH (*Therapie der Gegenwart*, 1910, li, 70) warmly recommends sabromin for the treatment of epilepsy. Sabromin, although it contains only one-fourth the amount of bromine contained by other bromides has an effect equal to that obtained by the other bromides. His average daily dose of sabromin was from 3 to 4 grams, given in either powder or tablet form. His patient, seemed to prefer the tablets which have no unpleasant taste. Froehlich observed no bromine acne from the long-continued use of sabromin, and speaks especially of the lack of any mental depression. He gives the details of fourteen cases, some of them under treatment for a period of ten months.

Veronal Natrium in Sea-sickness.—GALLER (*Therapie der Gegenwart*, 1910, li, 94) advises the use of veronal natrium for the treatment of sea-sickness. Galler has had good results by the use of veronal for this same condition, but veronal has the disadvantage of not being very soluble in water. Veronal natrium on the other hand, is soluble in five parts of water, and thus may be given in a concentrated solution which is rapidly absorbed and consequently more active. He gives one-half gram of veronal natrium dissolved in a small amount of water twice in twenty-four hours. If the patient is able to retain it for about ten minutes, which is with few exceptions the rule, there will be a relief from vomiting and nausea, lasting from ten to twelve hours. In mild cases, a single dose of a half gram at bedtime is usually sufficient.

Circulatory Failure in Acute Infections of Children: Causes and Treatment.—HOWLAND (*Boston Med. and Surg. Jour.*, 1910, clxii, 627) says that critical clinical observations and animal experimentation are in accord in referring the cause of circulatory disturbance in acute infections to a failure and final collapse of the vasomotor centre. There is also almost complete agreement obtained by animal experiments and by modern methods of determining the human circulatory capacity as to the drugs and methods most useful in this circulatory disturbance. He says that from the knowledge at present available, it seems that the continuous use of cold air, the use of caffein and camphor, reinforced by digitalis with infusions of salt solution and the careful administration, not too often repeated, of adrenalin, are our best methods to combat this dangerous condition.

The Treatment of Acute Dysentery by Intestinal Irrigation with a Five Per Cent. Solution of Silver Nitrate.—HEWES (*Boston Med. and Surg. Journ.*, 1910, clxii, 530) advocates the use of stronger solutions of silver nitrate in the treatment of acute dysentery than those ordinarily recommended. He used injections of a 5 per cent. solution of silver nitrate for the treatment of 10 cases. The treatment was instituted at an early stage, from the second to the fourth day of the diseases as so judged by the appearance of symptoms. The average duration of these 10 cases was ten days and the maximum duration, seen in 1 case, was fourteen days. Hewes gives the details of the treatment as follows: The patient when first seen was given a dose of magnesium sulphate. As soon as this drug had acted, irrigation by silver nitrate was given. The rectal tube was inserted from 8 to 12 inches and a pint or more, according to the capacity of the patient to hold the solution, of 5 per cent. silver nitrate, was injected. The injection was retained by the patient as long as possible, up to a half hour. Defecation was then allowed. Rectal injections of salt solution were given regularly after each movement during the course of the treatment. A second injection of silver nitrate was, as a rule, given after a period of two days. In some cases one injection only was used. A diet selected with the idea of reducing the amount of fecal food residue was given. The daily content of this diet was as follows: Lean meat, 300 gm.; three slices of toast with maple syrup; albumin water consisting of the white of 8 eggs in water. This was continued for five days. The diet was then increased by the addition of more toast, butter, tapioca, potato juice, and macaroni.

Digistrophan, a New Cardiac Tonic.—BOELKE (*Therapie d. Gegenwart*, 1910, vi, 153) has used digistrophan in the treatment of 85 patients with circulatory disturbances as a heart stimulant and speaks very highly of its good effects. Digistrophan is a combination of digitalis leaves and strophanthus seeds, and may be obtained in tablet form, each tablet containing 0.1 gr. digitalis leaves and 0.05 gr. strophanthus seeds. Boelke says that this new remedy has no cumulative action and has no irritant action upon the gastro-intestinal tract or the kidneys. Furthermore, digistrophan is stabile and its tonic action consequently is constant. Digistrophan has a marked diuretic action, but in order to increase this diuretic action, tablets may be obtained containing digistrophan in combination with sodium acetate or with caffein-sodium acetate.

The Treatment of Chronic Constipation and Acute Intestinal Paresis with Peristaltic Hormone. ZUELZER (*Med. Klinik.*, 1910, vi, 422) calls attention to a previous paper in which he described a hormone formed by the cells of the gastric mucous membrane that has a specific regulating action upon intestinal peristalsis. This hormone, he believes, occurs in all the organs of the body, but is especially abundant in the spleen. From the spleen it is now prepared commercially under the name of peristaltic hormone. Zuelzer tried this remedy in 21 cases of chronic constipation with a permanent curative result in 15, after a single intramuscular injection. On the other hand there was no effect in the remaining 6 cases. Zuelzer thinks that this remedy has a direct stimulating action upon the intestinal musculature and thus may be of great value in cases of acute paralysis of the intestine. The injections are harmless, although they cause a slight febrile reaction and slight local tenderness.

Peristaltic Hormone.—SAAR (*Med. Klinik.*, 1910, vi, 424) reports three cases of chronic constipation treated by a single intramuscular injection of from 15 to 20 c. c. of peristaltic hormone (Zuelzer). These three patients for a considerable time afterward had no return of their trouble. This treatment, however, was not uniformly successful. Saar thinks it advisable to give the injection early in the morning in order that the febrile reaction that usually ensues may subside.

The Treatment of Chronic Constipation with Agar-agar.—MARTINET (*Presse md.*, 1910, xxvi, 226) recommends the use of agar-agar for the treatment of chronic constipation. Agar-agar absorbs sixteen times its weight in water and promotes peristalsis by distending the intestine. Thus it is valuable in that type of chronic consipation due to too little residue from the food. He gives the agar-agar in doses of from 5 to 15 grains taken at breakfast in some sweet, such as fruit jelly or marmalade. It may also be given in a thick soup. Martinet prefers to give it in combination with food, although it may also be given in compressed wafers. In order to enhance the peristaltic action, Martinet at times combines small doses of cascara with the agar-agar.

Sarton, a New Food for Diabetics.—VON NOORDEN and LAMPE (*Therapie d. Gegenwart*, 1910, li, 145) acting upon the theory that protein of vegetable origin is tolerated by diabetics better than protein of animal origin, have experimented with the Soya bean. The Soya bean contains from 30 to 35 per cent of protein and only 6 per cent. of starch and fermentable carbohydrates. The Soya bean forms one of the staple articles of diet, especially among the poorer classes of Japanese. When prepared as a simple vegetable or salad the Soya bean is very unpalatable and leaves an unpleasant taste that persists for a long time after taking it. Von Noorden found that the Soya bean thus prepared had no favorable influence upon the sugar excretion in diabetics. Finally a method was obtained to render the Soya bean palatable and at the same time remove the starch and fermentable carbohydrates. This method was perfected commercially and the manufactured product may now be obtained under the name of sarton. It is best given in the form of soups, in which it may be combined with butter and meat

broths. Soup, thus prepared, is very palatable and is a vaulable adjuvant to the diabetic diet. Sarton may be used as flour is used in ordinary diets to thicken gravies and sauces for diabetics. Furthermore, the authors believe that Sarton is not only of value as a diabetic food, but also may be given to supply protein in cases of gout or kidney disease in which protein of vegetable origin is tolerated better than protein of animal origin. Sarton has the further advantage that it increases intestinal peristalsis without the formation of gas that other leguminous foods produce.

The Treatment of Chronic Intestinel Catarrh with Injections of Hot Gelatin.—Von Aldor (*Therap. Monatshefte*, 1910, xxiv, 171) reports excellent results with hot gelatin injections in the treatment of chronic catarrh of the large intestine associated with diarrhœa. He injects from 40 to 80 c.c. of a 10 per cent. solution of gelatin at a temperature of from 113° to 125° F. This solution is slowly injected through a tube, inserted into the rectum for at least five inches, because of the extreme sensitiveness of the sphincter muscle to heat. The injections are preferably given with the patient lying on the left side. After the injection the patient should lie still for two hours with heat applied to the abdomen. Von Aldor reports 7 cases treated by this method, with a complete cure in every case. He calls attention to the value of gelatin in the dietary of patients with a chronic intestinal catarrh, as recommended by Senator and Herter. Weil, Lumière, and Péhn have found that gelatin by the mouth is most efficacious in the treatment of the diarrhœa of infants, but so far as von Aldor knows, he is the first to recommend the use of gelatin by the rectum for the treatment of chronic intestinal catarrh.

Hypertension and the Value of the Various Methods for its Reduction.—Miller (*Jour. Amer. Med. Assoc.*, 1910, liv, 1666) relates his observations as to the value of various procedures for reducing abnormally high blood-pressure. He states that since some samples of nitroglycerin and sodium nitrite are inert, the activity of the preparation employed was first determined by animal experimentation. Miller's conclusions are as follows: (1) In moderate doses active preparations of nitroglycerin and sodium nitrite temporarily reduce the blood-pressure in the majority of cases of hypertension. (2) Erythrol tetranitrate causes a more prolonged reduction in blood-pressure than nitroglycerin or sodium nitrite, but so frequently causes severe headache that its clinical value is much impaired. (3) Headache after any vasodilator does not mean that we are getting the physiological effect in the sense that the blood-pressure is reduced, as the headache may appear independently of any change in pressure. A patient's blood-pressure may be decidedly affected by one of these vasodilators and uninfluenced by another. (4) Occasionally the blood-pressure of patients with marked hypertension may show very marked fluctuations without apparent cause. (5) A single sweat reduces hypertension less than a moderate dose of vasodilators. If sweats are given daily, a rather marked reduction of pressure lasting throughout the day, is observed not infrequently. When the sweats are discontinued the blood-pressure soon returns to its previous level.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.,
OF PHILADELPHIA.

Citrated Milk for Wasting Infants.—FREDERICK LANGMEAD (*Proced. Royal Soc. Med.*, 1910, iii, 103) reports 80 consecutive cases of wasting infants fed on undiluted citrated milk. Sodium citrate renders the curd in cow's milk more flocculent and soft, thereby overcoming the effect of the ordinarily hard, tough curd. Citration has usually been employed with dilution of the milk. But dilution increases the bulk of the mixture and tends to gastric distention. It also reduces the precentage of fat and sugar to proportions below that of human milk, and the process is complicated for the mother. The 80 cases reported consisted of 41 girls and 39 boys. The age at first attendance varied from three weeks to four months. All the cases were much under weight when first seen and most of them showed gastric and intestinal disturbances. They were all fed on undiluted citrated milk and close account was taken of their weight from time to time. The amount of milk was graded to the child's age. Citrated milk was not used on children under three weeks of age. Two grains of sodium citrate are added to each ounce of the mixture. It is usually dispensed in a watery solution and the requisite quantity added after bringing the milk to a boil. The child is brought back every week to be weighed and inspected. Citration is gradually lessened at about five months and omitted at six months. Its advantages are its simplicity, absence of manipulation, and cheapness. Objections have been raised to the amount of protein in whole milk, but Langmead believes the nature of the curd causes as much trouble as the protein. Constipation was not noticed more than in any other method of feeding. In 150 cases he has not seen œdema or urticaria due to increased coagulability of the blood. When this occurs it is probably due to too large doses. The results in the 80 cases cited were a uniform and often marked increase in weight in all cases, with improved or perfect gastric and intestinal efficiency—which tends to prove the value of this form of feeding for this class of infants.

Enlargement of the Thyroid in Rheumatism.—J. R. CLEMENS (*Archiv Pediat.*, 1910, xxvii, 353), since reporting a series of cases of rheumattism in children accompanied by enlargement of the thyroid gland, has noticed so frequently this condition in rheumatic disease in childhood that he now considers it a sign of rheumatism. Enlarged thyroid may be noticed before, during, or after the course of the disease. The degree of enlargement is not great but is sufficiently pronounced to give unnatural fullness to the neck, especially when viewed laterally. In children with enlarged thyroid glands a careful history should be taken in reference to growing pains, torticollis, and recurrent tonsillitis. There are a few references of the association of exophthalmic goitre with rheumatism.

Human Rickets as an Infectious Disease.—Stephano Mircoli (*Münch. med. Woch.*, 1910, lvii, 1127) in answer to a statement describing a diseased condition of the bones morphologically like osteomalacia and induced in rats by a diplococcus, states that in 1891 he isolated and cultivated organisms from the bones and central nervous system of children who had died during the first stages of rickets. These microörganisms belong to the order of physiologically human bacteria, being staphylococci, streptococci, and colon bacilli. Having confirmed these observations experimentally and by histological investigation, he concluded that human rickets is the result of an infection, mostly an auto-infection, from bacteria present physiologically, especially those from the intestinal canal. In 1894 he demonstrated experimentally the staphylococcic autoinfection from the intestine.

Methods of Avoiding and Controlling Epidemics of Poliomyelitis.—Paul Romer and Karl Joseph (*Münch. med. Woch.*, 1910, lvii, 945) discuss ways and means of preventing or cutting short epidemics of poliomyelitis. Prophylaxis must cover first the methods by which the virus of the disease is carried or spread. They state that domestic animals or pets, such as dogs, do not come under suspicion as carriers of the infection. It is more probable that the virus is contained in secretions of the nose and mouth and in this way the infection is spread by healthy carriers. Attention is called to the similarity between meningitis and poliomyelitis. Flexner and Lewis showed, experimentally, that the secretions of the nose and mouth in an ape suffering from poliomyelitis were capable of causing the disease, and therefore contained the infective element. It is not improbable, therefore, that the disease in children is spread by carriers with mild constitutional symptoms but with infective secretions, direct contact with these carriers conveying the infection. The virus, even when subjected to a process of drying for days, shows such tenacity and strength that the possibility of the spread of the disease through dried expectoration must be considered. Ordinary disinfectants are inadequate, but experiments on infected rooms show that formaldehyde disinfection killed the virus in seven and a half hours. As regards serum treatment in this disease, Römer and Joseph believe that there are specific antibodies in the serum of animals in which poliomyelitis has been induced, and that a safe and effective method of serum vaccination against the disease is possible. They have proved this possible by experiments on apes, having successfully vaccinated apes with a mixture of this virus and the antiserum. After vaccination these apes were unaffected by injections of the virus, which in the controls not previously vaccinated caused the typical disease and death. They therefore conclude that the serum of apes which have recovered from an attack of poliomyelitis, or have been properly and thoroughly immunized by vaccination, counteracts or destroys the active principle of the virus by long contact within the body. The further proof of specific, obtainable antibodies in poliomyelitis may be expected with surety.

Nursing Infants as Typhoid Carriers.—Rommeler (*Münch. med. Woch.*, 1910, lvii, 956) states that Koch's campaign against typhoid fever has demonstrated that children and nursing infants are often responsible for the spread of this disease. The investigations of Conadi and others show

that mild and unsuspected typhoid infection in children takes an actual part in spreading the disease from family to family. While small children are not as prone to typhoid as adults, yet the mildness of the course and symptoms of the disease in children makes it hard to take timely and proper precautions against its spread. A young woman who was nursing a child one and a half years old developed typhoid and was removed to a hospital. The child was taken in by a neighboring family who took care of it. It was noticed that the child had a slight diarrhœa and seemed slightly unwell for a short time. Within two weeks the mother of this family developed typhoid. During the next two weeks this woman's three children, her niece who was visiting her, and a servant who lived with the family all developed typhoid, and the servant died from it. As a further proof that the infected baby was the cause of the six cases of typhoid, it was carefully examined with the result that two positive Widal reactions were obtained from its blood and typhoid bacilli were twice isolated from its feces. The child itself had shown only a short, slight indisposition and a mild diarrhœa when it was taken in by this family. Such instances show that unsuspected or undiagnosticated typhoid infection in children, and especially in nursing infants is an important factor in the spread of the disease. Rommeler states that when a woman develops typhoid fever while she is nursing an infant, both infant and mother should be sent to a hospital, or the infant be treated with the same careful restrictions as if it had typhoid fever. This plan will prevent the spread of the disease by infants.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

The Care of Pregnancy and Labor Complicated by Nervous Overdevelopment.—NEWELL (*Surgery, Gynecology, and Obstetrics*, March, 1910) draws attention to the increasing number of patients who are badly developed, poorly nourished, and by reason of excessive nervous susceptibility are bad cases for parturition. In attempting to care for such in labor, not only must the pelvis be accurately measured, but a careful estimate made of the relative size of mother and child. A second consideration of importance is the estimate of the muscular power of the individual patient and the prompt resort to operative delivery in those women unfit for labor, before exhaustion develops. The nervous resistance of the patient is a most important factor, and may determine the choice of the method of delivery. Many women are overtaxed by the demands of society, or by the effort to attain high scholarship in women's colleges. Another group of patients demanding especial attention are those who have always been sickly and delicate, and whose lives have been preserved by unusual care.

These women are often unfit for parturition. Those patients who develop a lack of accommodation to pregnancy, manifested in the development of toxemia, form a considerable class whose care demands especial consideration. In prophylaxis the effort should be made to limit the overstrain which modern education and society bring upon young women. During pregnancy each case must be studied individually, and at the time of labor such methods adopted as are likely to prove successful. To prevent the nervous shock of labor, anesthetics may be early employed, and in Newell's experience morphine and scopolamine, in graded doses, have given good results. Delivery should be accomplished as soon as possible by appropriate surgical means. It is equally important that such patients be given special care during convalescence. The repair of lacerations, exercises which tend to develop and strengthen the pelvic and abdominal muscles, and rest in bed for three weeks after confinement, are all important. In choosing a method of delivery, if the pregnancy be the first, and the patient has had repeated miscarriages, unusual value may be placed upon the life of the child. If the patient has passed through previous labors and has done badly, the effort must be made to ascertain the reason for the unfavorable result, so as to avoid a second failure. The indication for the elective Cesarean section in competent hands should be extended, and will give the best results for mother and child in many of these cases.

The Treatment of Placenta Prævia.—HAUCH (*Monatsschrift f. Geburts. und Gynäk.*, Band, xxxi, Heft 5, 1910) reports the results of the treatment of placenta prævia in 240 cases in the Copenhagen clinic. Dilatation of the cervix by Bossi's dilator and vaginal Cesarean section were not considered suitable operations for placenta prævia. The classic Cesarean section was not performed for this indication. Among the 240 cases there were 18 or possibly 20 coming within the indications given by Sellheim, Bumm, Küstner, and Pfannenstiel, for extraperitoneal section. In view of the lack of extensive experience in this operation for placenta prævia, these cases were delivered by other methods.

The examination of the result shows that the 240 cases were observed in 24,000 parturient women, giving a frequency of 1 per cent. Of these, 22 mothers perished, a mortality of 9.1 per cent.; of these patients, 144 were treated by the use of elastic bags, with a mortality of 16, or 11.1 per cent. Among these were 60 cases of central placenta prævia, and 84 cases of partial placenta prævia. Among these patients the elastic bag was placed outside the ovum in 96, with a maternal mortality of 15.6 per cent.; while the bag was placed within the cavity of the ovum in 48, with a mortality of 2.1 per cent.

TheBraxton-Hicks method of delivery was employed in 18 cases, with no maternal mortality. Of these, there were 6 cases of central placenta prævia, and 12 of partial. In the whole series the most common cause of death was hemorrhage and exhaustion. Septic infection proved fatal for the mothers in 1.2 per cent. of cases. The mortality of central placenta prævia was 15.3 per cent.; of partial placenta prævia, 5.8 per cent. Of the 144 cases treated by the use of dilating bags, there were 28 primiparæ, with a mortality of 3.6 per cent., and 116 multiparæ,

with a mortality of 5.2 per cent. In these patients there were 235 in whom the ovum was sufficiently developed to be classed as a fœtus. The mortality among these was 62 per cent. In cases in which the dilating bag was used without the cavity of the ovum, the fœtal mortality was 44 per cent.; and in which the bag was introduced within the cavity of the ovum, the fœtal mortality was 52 per cent. In central placenta prævia the fœtal mortality rose to 65 per cent., and in partial placenta prævia to 44 per cent.

In cases of infection the origin of this complication could be ascribed, as a rule, to the introduction of the tampon, often before the patient had been brought to hospital. The prolonged use of the bag for four or five hours also predisposes to infection. This danger was greater when the bag was applied outside the cavity of the ovum than when it was introduced within the ovular cavity, and the conclusion is reached that it was unjustifiable for this reason to hasten labor in placenta prævia by the use of the elastic bag. In 11 cases, considerable laceration of the cervix was observed, and among these there were 9 which had been treated by the use of the elastic bag. Lacerations which are not extensive are often overlooked, but as they give rise to hemorrhage and infection they furnish a considerable complication. Wherever the extraction of the child was difficult, laceration was inevitable. It is advised that a bag at least 10 cm. in diameter should be employed for dilatation, so that as complete dilatation as possible may be obtained. The operator is cautioned that if in version and extraction the operation does not proceed readily, he should desist and allow the child to be spontaneously expelled. In 70 per cent. of cases in which the elastic bag was employed a weight was attached to the bag to hasten dilatation. Among these patients there were five severe lacerations of the cervix, with two deaths from hemorrhage. The bag remained in position in these cases between five and six hours on the average. Where a weight was not attached to the bag, lacerations were much less frequent and severe, and the bag remained between three and four hours on the average. In primiparæ the use of the bag was prolonged to over six hours, and when a weight was attached to the bag the average duration of its use was seven and nine-tenths hours, while without a weight four and four-tenths hours usually completed dilatation. It is difficult to decide whether the use of the weight could be definitely assigned as the cause for lacerations, but the results were carefully observed, as stated. The operator is urged to be excessively cautious in version and extraction in placenta prævia, and especially after the use of dilating bags. The weight should be attached to the bag only in those cases in which there is considerable hemorrhage or the labor is unduly prolonged. If the interests of the mother alone are to be considered, and especially if the patient cannot be brought to the hospital, the Braxton-Hicks method remains the safest and most applicable.

The Control of Hemorrhage in Placenta Prævia.—KUPFERBERG (*Monatsschrift f. Geburts. und Gynäk.*, Band xxxi, Heft 5, 1910) calls attention to the former statistics of the mortality of placenta prævia as 50 per cent. for the mothers, and 90 per cent. for the children. At least one-half of the maternal mortality arose from hemorrhage. Recent

statistics in general practice give a maternal mortality of 20 per cent. for mothers, which is reduced in hospitals to between 5 and 6 per cent., while the mortality for children in private practice, in cases of placenta prævia, is 60 per cent., reduced in hospitals to 20 per cent. The writer refers to 3 cases of death from hemorrhage in placenta prævia in his experience of eighteen years of obstetric practice. All occurred from extensive lacerations of the cervix which could not be controlled by suture and the use of the tampon and other means. He draws attention to the common mistake of proceeding to rapid extraction after turning by the Braxton-Hicks method. The chance of saving the life of the child is so slight, and the increased risk to the mother is so great, that immediate extraction is not justifiable. He has observed lacerations so extensive that bleeding occurred beneath the peritoneum in a region inaccessible to suture from below. Among others, the writer describes the case of a multipara upon whom version and extraction had once been performed because of eclampsia. She suffered at that time from severe laceration of the cervix and perineum. The cervical laceration did not heal, and although the perineum was closed there remained a rectovaginal fistula. Other pregnancies proceeded successfully, but in the forty-first week of the last pregnancy the patient was taken with sudden hemorrhage. On examination there were no labor pains, the cervix permitted the entrance of one finger, the placenta prævia was lateral, and the child in transverse position and viable. The vaginal tampon was immediately applied. After twelve hours there was a renewed severe hemorrhage, with the expulsion of the tampon. The patient was then transported to the hospital, the membranes ruptured, and an elastic bag introduced. Six hours afterward the bag was expelled with repeated hemorrhage and prolapse of the umbilical cord, which pulsated feebly. As the patient desired, if possible, to save the child, the cervix was dilated as completely as possible by bags, and version and extraction performed. The child was born asphyxiated and could not be revived. Very severe hemorrhage followed delivery, complicated by a deep laceration of the cervix upon the right side extending through the vaginal tissue. Although the uterus contracted well, hemorrhage persisted. Momburg's method of compression was tried without result. The laceration was closed by sutures under inspection with the aid of a speculum. The uterus and vagina were tightly packed and compression bandages placed upon the abdomen and perineum. Ergotin and salt solution were given hypodermically. An hour after the application of the tampon the gauze was blood-soaked and the patient in collapse, with a pulse of 150. As a last resort the abdomen was opened and supravaginal amputation of the uterus performed. The patient rallied, recovered without fever, and was discharged in good condition six weeks later. The peritoneal laceration which had been sutured was subsequently repaired. When the patient was discharged there was a firm scar with some contraction of the tissue at the right upper extremity of the vagina. In this case, 500 c.c. of salt solution was used to distend the bag. The child weighed nine pounds. In the literature the writer has collected three cases in which extirpation of the uterus was performed for uncontrollable postpartum hemorrhage. These three cases resulted successfully.

The Importance of Resistance of the Soft Parts during Labor as Influencing Fœtal Mortality and Maternal Mortality.—SEITZ (*Archiv f Gynäk.*, 1910, Band xc, Heft 1) contributes an elaborate paper from Döderlein's clinic in Munich, illustrating this subject. After reviewing the different conditions in which prompt delivery may become necessary, he draws attention to the importance of abnormalities and undue resistance on the part of the soft portions of the genital canal as influencing fœtal mortality and maternal mortality. He draws attention to the value of vaginal hysterotomy as the most efficient method of overcoming these conditions. He also calls attention to the fact that in good hospitals and in competent hands the mother's dangers are not increased by this procedure. In 5036 parturient patients in Döderlein's clinic there were nine deaths from puerperal sepsis, a mortality of 0.17 per cent., and in these are included a number of cases infected before admission to hospital. Of these 9 patients, 2 had abdominal Cesarean section, undertaken in the interests of the child. No mother perished from operation undertaken to overcome abnormalities in the soft portions of the genital canal. Between the years 1900 and 1904, in the Munich clinic, the mortality for five years of parturient women was 0.308 per cent. Since vaginal hysterotomy has been employed the mortality has grown less rather than more. When fœtal mortality is considered, there were 117 fœtal deaths among these cases, of which, 19.7 per cent. could be ascribed to abnormalities in the muscular and elastic tissues. In previous years, the mortality from this condition among the children was 29.4 per cent.; in recent years the mortality of children in contracted pelvis was 9 per cent., while formerly it was 17.3 per cent. It is hoped that the fœtal mortality may be reduced to 1 per cent. by suitable operation. Attention is called to the importance of transferring all complicated cases of labor as soon as possible to suitable hospitals.

GYNECOLOGY.

UNDER THE CHARGE OF

J. WESLEY BOVÉE, M.D.,

PROFESSOR OF GYNECOLOGY IN THE GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D. C.

Actinomycosis of the Uterine Appendages. CARL WAGNER (*Surg., Gyn., and Obst.*, 1910, x, 148) believes actinomycosis of the uterine appendages is practically always a secondary affection from the gastrointestinal tract, perhaps most frequently from the vermiform appendix. The mode of infection is thought to be by infiltration, penetration, continuity, and contiguity. After the acute stage the infected appendage becomes surrounded by dense connective tissue formation, which may lead to erroneous diagnosis of different kinds of tumors of hard consistency. In many cases the gross macroscopic and the microscopic pictures are often mistaken for tuberculous invasion. Wagner says

Bollinger's desideratum for the diagnosis of actinomycosis, namely, that corpora flava must be present, is untenable at the present time. Repeated bacteriological examinations, and sometimes long and tedious ones of the same specimens, must be made, to insure a correct interpretation of suspicious pathological material. Inoculation with pure cultures into the animal is not attended with success. Only the injection of pus with actinomycosis, or the ingestion of material upon which actinomycosis is grown, will prove successful in the production of actinomycosis in the animal. Actinomycosis does not travel by the lymphatics, and probably not by the blood route. The prognosis is favorable in circumscribed cases, which is most likely the condition in which we find the uterine appendages. The treatment consists in radical extirpation and free drainage; the application of tribromphenolbismuth, or irrigation of the fistula with copper sulphate, and the internal administration of large doses of iodide of potassium up to 75 grains a day, which exerts a positive healing effect. A careful study of apparently innocent pus from pelvic disease, as well as secretions from obstinate fistulas after laparotomies from ovarian and tubal pus infections may result in finding actinomycosis more commonly to be the cause of the pathological changes than has been the case heretofore, and in consequence, different treatment inaugurated should insure, perhaps, a higher percentage of final cures.

Primary Cancer of the Fallopian Tube.—DORAN (*Jour. Obst. and Gyn., Brit. Empire*, 1910, xvii, 1) has tabulated 38 cases of primary cancer of the Fallopian tube. Ten of the patients were between forty-five and fifty years of age when the disease was detected; 7 between fifty and fifty-five; 6 between forty and forty-five; and 5 between fifty-five and sixty; 2 had passed their sixtieth year; 3 were between thirty-five and forty; 2 were under thirty, and in 3 the age was not given. Of 100 Doran has collected, the youngest age found recorded was twenty-seven years. From this data it is plain the disease rarely occurs before the menopause, but is most common at or shortly after that period of life of the woman. Nineteen had been one or more times pregnant, 8 were reported as sterile, and in 11 no record was found. In 2, symptoms, principally menorrhagia and vaginal discharge, had existed three years, but usually the symptoms had lasted one to twelve months; pain was present in 25 cases, but in many of these the disease had invaded other structures. In 34 a swelling of some kind was noted, ranging from distinct resistance in a vaginal fornix to an abdominal tumor, but in several there were uterine or ovarian tumors as well. In one, marked ascites was present, and in another to a less degree. In over 27 per cent. of recorded cases of primary cancer of the Fallopian tube free watery vaginal discharge was a marked symptom. Uterine fibroids and ovarian cysts, exclusive of tubo-ovarian cysts, were each present in 4 cases. Doran insists the fimbriated end of the tube closes very early in primary cancer of the tube in contrast to the lateness in benign papilloma of this structure. In 9 there was a distinct history of pelvic inflammation, and in 12 a doubtful one, while in 17 there was no reliable clinical history. In 12 the disease was bilateral, in 10 on the right side only, and in 12 in the left. Two others were unilateral, and in 2 no statement regarding this point was made. Thirty-seven of the patients

were operated upon, but the after histories are so incomplete as to be nearly valueless. Doran states primary cancer of the tube is clearly not a malady of extreme rarity, and that as in at least 27 per cent. of all cases distinct and more or less free watery discharge was present, it is clear that when that symptom is found to be associated with a pelvic or abdominopelvic tumor, that an exploratory operation should be performed, and if a tumor of the tube is detected, the uterus and remaining appendages, as well as the effected tube, should be removed.

Genital Hemorrhages in Cases of Hemophilia.—L. FRÄNKEL and L. BÖHM (*Monats. f. Geb. u. Gyn.*, 1909, xxx, 417) report 7 cases of hemophilia in which uterine hemorrhage was marked. One case proved fatal. In 2 cases there was a family history of hemophilia, and in the other 5 the condition was considered sporadic. The question of hemophilia arises often in cases of menorrhagia and Fränkel and Böhm would accept only such cases as genuine which show an excessive menstrual flow, with intact genitalia, resisting for a long time the usual therapeutic measures, and which have either a family history of hemophilia or a tendency toward severe hemorrhages from other organs. In the literature they find 151 cases of hemophilia in women, 46 of which they consider doubtful. Of the 151 cases a family history of hemophilia was obtained in 99 cases, excluded in 34, and doubtful in 18. They do not find that hemophilia necessarily makes its appearance with the establishment of menstruation, nor that this function is always of grave danger in such women. At least 100 cases of pregnancy complicating hemophilia are recorded. Only once was there hemorrhage before the expulsion of the placenta. In 56 cases the hemorrhage was severe and in 5 fatal. Severe hemorrhages need not necessarily be expected at the time of labor, but there seems to be an increased tendency for hemorrhages late in the puerperium. In general women with hemophilia suffer from uterine hemorrhage, yet as compared with men the prognosis is not made more unfavorable on that account. Fränkel and Böhm advise against marriage, and recommend internal treatment for the condition and local treatment for the uterine hemorrhages, of which firm packing of the uterus and vagina is considered the best.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.,

ASSOCIATE IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

Radium and Radiotherapy in Skin Diseases.—LOUIS WICKHAM, of Paris (*Brit. Jour. Derm.*, November, 1909, p. 357), discussed this subject before the British Medical Association, held at Belfast, the following

being a summary of the article. Radium is employed (1) in glass tubes, which may be introduced into the passages of the body or into growth; or (2) in the form of a varnish, on some metallic base or on linen. The use of filtration by screens composed of aluminum, lead, or other substances has brought about a complete change in the treatment with radium. The quantity of the rays can be modified by employing screens of varying degrees of thickness, and their quality is changed because of the alteration in their penetration. Radium may be applied (1) direct to the surface, when the rays are very numerous, useful in superficial disease (as in lichen patche); and (2) with medium filtration, the rays being less numerous for deeper-seated diseases (as carcinoma cutis); and lastly, (3) with dense filtration, the rays being few in number and very penetrating for deep-seated growths. It is not always necessary to produce inflammatory reaction, because the rays have a specific effect, and if a deep action is called for the application may be prolonged without setting up any surface inflammatory reaction. The radium apparatus may be used in various ways, as by holding it in the hand, by fixing it with pincers, or by employing supports of one kind or another (as a catheter); it may also be used in gray oil and in waters (as washes and baths). Dermatitis (as of the hands) may follow the employment of radium by the operator, precisely as in the case of Röntgen rays. The large and important new field seems to be gradually opening in therapy by this agent.

Treatment of Nevus by Radium.—Lewis Jones (*Brit. Jour. Dermatology*, November, 1909) states that vascular nævi are favorably influenced by the radiations of radium, thus confirming the experience of other observers. Twenty-four cases were treated in the electrical department of St. Bartholomew's Hospital. The specimen of radium used consisted of 15 mg. of radium bromide with a radio-activity of 500,000, enclosed in an aluminum capsule or button 1 cm. in diameter, giving off a uniform radiation from the entire front surface of the button in any position. The button is fixed on the part to be treated, with a layer of thin gutta-percha tissue interposed. The time was generally one hour. All were small, actively growing, florid nævi in young babies, and all underwent retrogressive changes after the first application of the radium. Usually reaction manifests itself in five days, in the form of redness of the surface, followed very soon by a gradual flattening of the nevus if it has been previously raised; then paleness sets in, with slight desquamation or the formation of a thin, dry scab, which falls off and reforms several times, while the nevus continues to become paler and less defined in outline, finally fading away and the skin assuming a natural appearance, though retaining for some time a faint pink image of the original nevus. No sore or moist surface was observed. The whole process of evolutions requires from four to six weeks. Half the number of cases were completed with a single application; six required a second application.

Radium: Its Therapeutic Value.—W. D. Butcher (*Brit. Med. Jour.*, September 12, 1909), well known as a worker in this field, describes its employment for the cure of thickened states of the skin after scarring from rodent ulcer, in lupus vulgaris, carcinoma cutis, nevus, and for the

relief of the itching in pruritus. It is also recommended for the treatment of the lesion of primary syphilis, while it has also proved useful in secondary infiltrations. The author makes use of 10 mg. of radium bromide from Brunswick, said to have a radio-activity of 1,800,000 "uranies."

Treatment of Lupus Vulgaris.—PROF. E. LANG, of Vienna (*Deut. med. Woch.*, October 7, 1909), gives a summary of his labors at the "Lupus-Anstalt," with a record of cure in 262 cases of lupus out of 291 patients examined six months after the end of the treatment. From the year 1892 to date 412 cases were treated. This favorable result is attributed to a combined Finsen light and operative treatment together with general remedies. A note of warning is sounded against the actual cautery and the sharp curette, which leave scars, and thus interfere with the good effects to be derived from the Finsen light. The author believes that the disease may be due to some internal centres of infection as well as from external local causes. [One of as has recently visited this famous Institute in Vienna, and can speak from observation of the excellent work done for the cure of this disease.]

Acute Septic Pemphigus.—JOSEPH GRINDON (*Jour. of Cutaneous Medicine*, October, 1909) gives the notes of a case and considers the subject in its several aspects, especially its relation to other diseases—in particular dermatitis herpetiformis and severe herpes iris in the beginning of the attack, but later all the symptoms, local and general, became aggravated and death occurred in the third month. There was no history of a wound or abrasion to account for a local infection. The whole subject, obscure as it is as to the origin of the infection, is in some instances worthy of further study, as such cases are met with, and, as the author states, acute septic pemphigus has been recorded in a number of cases possessing a well-defined clinical entity. Some of the post-vaccinal cases (as Howe's), and Bowen's cases, and the Pernet-Bullock type of diseases, come under this head.

Cases of Bromide Eruption Mistaken for Blastomycosis.—O. S. ORMSBY (*Jour. Cutan. Dis.*, October, 1909) narrates three cases in which the diagnosis was difficult. The lesions in all three cases were on the legs and were similar, being pustular and papulopustular. The margins were elevated and crusted, surrounded by bluish-red or pale-red areolæ, in which there were many miliary pustules. In the early stages the bromide eruption is more actively inflammatory, but later the processes in this respect are very much alike, and on a superficial examination the two diseases are clinically counterparts of each other. It is essential in any case suspected to be one of blastomycosis, in which bromides have been administered, to demonstrate positively the presence of the causative organisms (blastomycetes) before making the diagnosis.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL,

ASSISTED BY

G. CANBY ROBINSON, M.D.,

CLINICAL PATHOLOGIST TO THE PRESBYTERIAN HOSPITAL, PHILADELPHIA.

Permeability of the Walls of the Intestines.—MEYERHOFER and PRIBRAM (*Ztsch. f. exp. Path. u. Ther.*, 1909, vii, 247) consider the permeability of the intestinal walls from a purely physical point of view, regarding the intestinal wall as a colloidal membrane, and absorption from the intestine as entirely a physical and not a "vital" phenomenon. They have found that the healthy intestinal wall transmits albuminous bodies, ferments, toxins, hemolysins, and antitoxins, but that there is a considerable resistance to their diffusion which prevents transmission for certain periods of time. In the healthy organism this time is more than sufficient for the digestion of albumins, for rendering toxins inert, and to allow the ferments to produce their effects.

If the intestinal walls are inflamed they are much more permeable to crystaloids than those of normal intestines, and colloid substances pass through also much more readily, requiring for passage about one hour instead of from six to twelve hours, as in the healthy intestinal walls. These results were obtained by experimenting with the intestines of very young animals removed immediately after death, and enteritis was produced by feeding, for instance, one of a litter of rabbits on foreign food (cow's milk); another rabbit of the same litter which had been allow to feed naturally was used as a control. After filling the intestines wtih various solutions they were suspended in physiological salt solution, which was tested from time to time for the substances contained in the intestines.

The authors believe that this property of inflamed intestinal walls of transmitting various substances much more rapidly than do the healthy intestines, may have a very important bearing on many pathological conditions. The rapid diffusion of foreign albumins may cause a severe disturbance in nutrition; the quick diffusion of ferments may be not indifferent for the organism; the diffusion of toxins and metabolic products in the epidemic diseases associated with enteritis (cholera, typhoid fever, dysentery) may be a factor in the fatality in these diseases; and finally the diffusion of hemolysins produced by intestinal bacteria and parasites may lead to severe anemias, an assumption which has had an eager advocate (Grawitz). The rapid diffusion of antibodies through the inflamed intestines may have a bearing on therapeutics. The authors will report later on the difference between the action of the intestines before and after death. They state, however, that the permeability depends on the relation of the amount of albumin to the water content of the membranes, a relation slow to change in the excised membrane.

Iodine and Exophthalmic Goitre.—TH. KOCKER (*Proc. of 39th Congress of German Surg. Soc., Semaine medicale*, 1910, xxx, 163) draws attention to the effects of iodine upon the body in general and the thyroid gland in particular. Iodine causes a regression of the thyroid gland and a disappearance of goitre, but, on the other hand, symptoms which resemble more closely Basedow's syndrome. The alteration in the blood and characteristic exophthalmus can be produced by large doses of iodine, the symptomatology differing from that of acute iodism. It is a question of iodism of the thyroid gland. The latter stores up iodine and forms with it a compound which will provoke the symptoms of Basedow's disease. Iodine is necessary to the function of the gland, but there are many individuals who are disposed to acquire Basedow's syndrome under the influence of repeated doses of iodine. This predisposition is hereditary or acquired. Many individuals present such symptoms following a simple painting of the skin with iodine.

A Cytoscopic Study of the Cerebrospinal Fluid in General Paresis.—It has been an accepted fact that in all metasyphilitic processes, there occurred a lymphocytosis which has been estimated by counts per cubic millimeter. But STERN (*New York Med. Jour.*, 1910, xci, 909) states this condition is due to degenerated endothelial cells. Undoubtedly, typical lymphocytes do occur, but they are due to a contamination from bleeding into the spinal fluid or blood in the needle during its introduction. The author made a comparative morphological study of both lymphocytes and endothelial cells present in the pleural cavity, and the morphology and degenerative changes in the endothelial cells were the same as in the cells found in the spinal fluid. In no case was he able to find a cell of lymphocytic structure in spinal fluid unless blood contamination was demonstrable either grossly or after centrifugalization. In metasyphilitic diseases, these degenerated endothelial cells were usually present without centrifugalization, while in controls, centrifugalization was necessary to find them. Further study revealed plates as occurs in desquamation and the morphology of the cells was similar. The presence of a subacute leptomeningitis accounts for the desquamation and degeneration and their presence in increased numbers. The previous error he attributes to the low objectives used, $\frac{1}{4}$ and $\frac{1}{6}$ inch, this study having been made with a $\frac{1}{12}$ inch oil immersion. In conclusion, for diagnosis, he feels safe in declaring a case one of general paresis upon the demonstration of a large number of endothelial cells.

Meningococcus Bearers.—S. COSTA (*Comp. rendu. Soc. de biol., Paris*, 1910, lxviii, 776) in studying the etiology and prophylaxis of epidemic cerebrospinal meningitis, made a careful search for chronic bearers in the associates of six cases under observation. Cultures were made from the nasopharyngeal mucus. Colonies which presented the cultural and morphological characteristics of the meningococcus were then submitted to the agglutination test with anti-meningococcic serum. The first case, an officer, was associated with a bearer in the person of his body servant. For the second, a soldier, out of 18 cultures, 2 bearers were found. They had slept side by side with the patient, under the same blankets, in prison, two nights before his admission to the hospital. Five bearers were found in 26 cultures from the associates of the third case. Out of 24 cultures, but 1 bearer was found in the case of the fourth

patient. Among the 8 bearers in the fifth case, two were neighbors of the patient and one had lost his wife from the disease a month previously. Among the 7 bearers in the sixth case, two were musicians like himself and lived intimately with him.

Experimental Typhoid Fever.—METCHNIKOFF and BESREDKA (*Semaine médicale*, 1910, xxv, 166) have been able to reproduce in a chimpanzee a febrile disease similar to human typhoid fever by feeding the animal fecal material taken from a typhoid patient at the Pasteur Hospital. This fecal material gave a pure culture of Bacillus typhosus. Seven days after the beginning of the experiment, the temperature rose to 40.5° but was 38° four days later. At the height, Bacillus typhosus was recovered by blood culture. A dysentery followed, to which the animal succumbed on the thirteenth day. The dysenteric stools also yielded the specific bacillus. At autopsy, there were hemorrhagic erosions of the mucous membrane of the large intestine, but in the ileum the Peyer's patches were considerably hypertrophied, corresponding to those in early typhoid fever in man. The retrocecal glands were congested and enlarged, and contained foci of necrosis. In a word, their experience with the chimpanzee shows that the ingestion of fecal material of man rich in typhoid bacilli is capable of producing typhoid fever comparable to the human disease.

Typhoid Bacteriology.—STOKES and STONER (*Jour. Infectious Dis.*, 1910, vii, 457) have collected the statistics of the literature in regard to the bacteriology of typhoid fever. In the urine of 622 typhoid patients during the attack, the cultures were positive in 45 cases, or 7 per cent. These cases were in series reported by Thomas, Hiss, Petruschky, Richardson, Horton-Smith, Blumer, Müller, and Graf. In 744 cases, during convalescence, the bacilli were found in 45 cases, or 6 per cent. Paratyphoid bacilli were recovered from the urine in 4 per cent. of 259 cases during the attack, and 3 per cent. of 92 cases in convalescence. In the stools, the positive cases amounted to only 20 per cent. out of 5844 patients. Twenty-five per cent. of these were present in the second week, 20 per cent. in the third, 16 per cent. in the first, and 10 per cent. in the fourth. Of 703 cases in convalescence, only 2 per cent. were positive. In 954 cases of paratyphoid infection, 5 per cent. of the stools yielded the bacillus during the attack, and 3.5 per cent. of 31 cases in convalescence; 2359 blood cultures yielded the typhoid bacillus in 1625 instances, or 68 per cent. In the first week, the positive cultures were 78 per cent., 69 per cent. in the second, 57 per cent. in the third, 32 per cent. in the fourth, and 25 per cent. after the fourth week. The authors report two instances of isolation of Bacillus pyocyaneus from the circulating blood on the fourth day of a typhoid-like attack. They have been able to find only seven other cases in the literature.

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All communications should be addressed to—

DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D., AND W. S. THAYER, M.D.

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